



City-Wide Streetscape Implementation Manual and Financial Strategy Plan



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Final Draft June 2014



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Acknowledgements

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INTRODUCTION

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“A **Complete Street** is designed for all ages, abilities, and modes of travel. On Complete Streets, safe and comfortable access for pedestrians, bicycles, transit users and the mobility-impaired is not an afterthought, but an **integral planning feature.**”

- *Complete Streets for Canada*

As a rapidly growing municipality, Vaughan has the opportunity to be innovative and a leader in putting countless lessons in streetscape design and implementation to use. The momentum at which Vaughan is growing is what makes this opportunity unique. Vaughan is at a stage where it is growing from a largely suburban context into a number of intensified urban nodes. The development of these nodes presents a challenge in that it is nothing that Vaughan has typically developed before. The opportunity is that Vaughan can do it right.

The growth Vaughan is experiencing puts immense pressure upon its existing streetscape network. However, it is not only vehicular traffic demanding space in the streetscape. Pedestrian traffic will rise on Vaughan’s streetscapes with the introduction of population density, transit investment, a mobility hub and economic development. A rising retail and service industry will need greater streetscape infrastructure to accommodate pedestrian demand. Streetscapes will begin to define people’s impression of Vaughan.

Vaughan is committed to building a sustainable city. The term sustainability is a combination of the principles of the social, the ecological and the economic. While the ecological and social aspects of streetscape design are particularly well developed, the understanding of the economic environment is less defined. With the Level of Service concept, the Vaughan City-Wide Streetscape Implementation Manual aims to strengthen the relationship between these principles developing a well-rounded streetscape design manual and cohesive streetscape network.

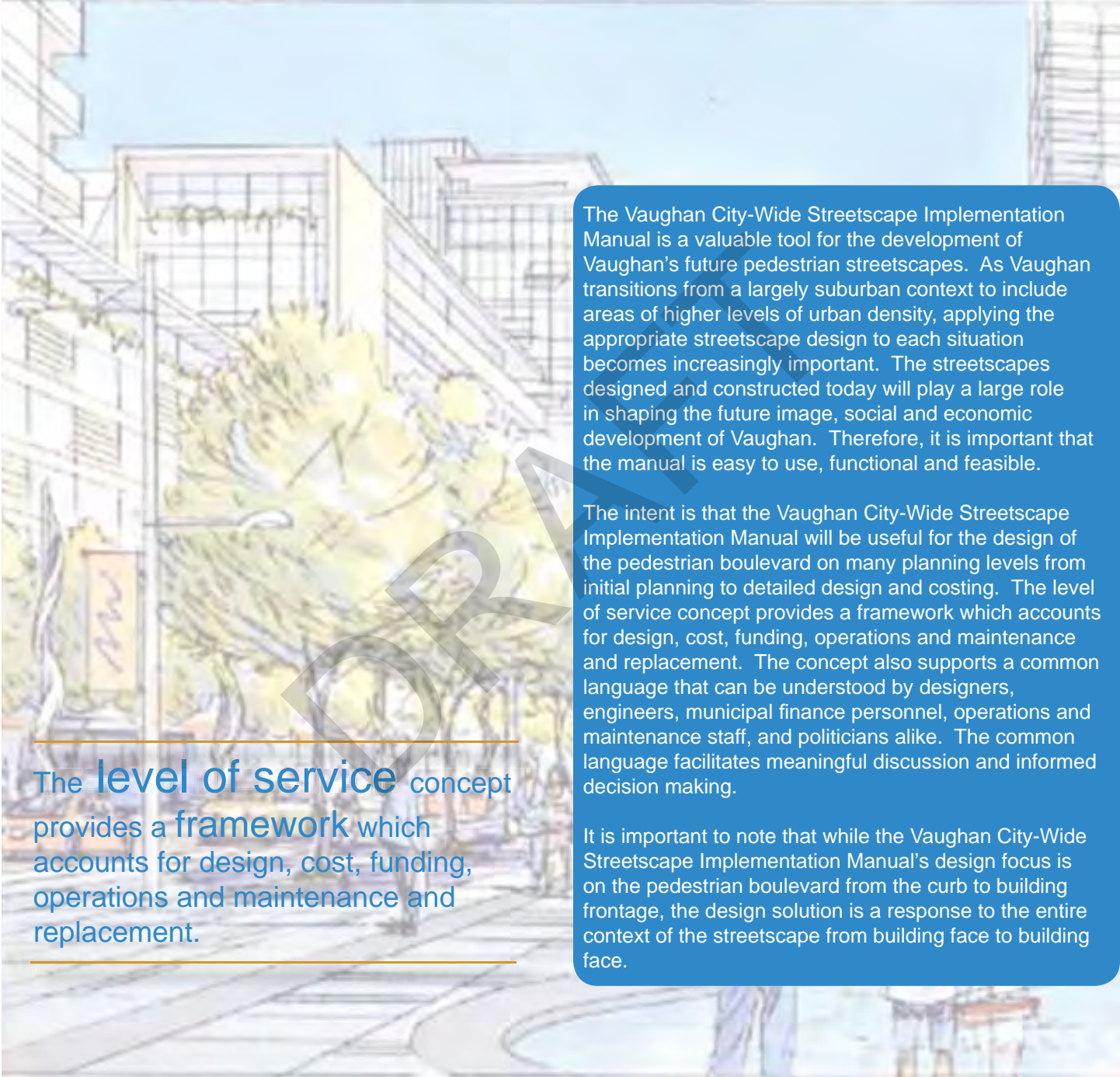
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VISION

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The **level of service** concept provides a **framework** which accounts for design, cost, funding, operations and maintenance and replacement.

The Vaughan City-Wide Streetscape Implementation Manual is a valuable tool for the development of Vaughan's future pedestrian streetscapes. As Vaughan transitions from a largely suburban context to include areas of higher levels of urban density, applying the appropriate streetscape design to each situation becomes increasingly important. The streetscapes designed and constructed today will play a large role in shaping the future image, social and economic development of Vaughan. Therefore, it is important that the manual is easy to use, functional and feasible.

The intent is that the Vaughan City-Wide Streetscape Implementation Manual will be useful for the design of the pedestrian boulevard on many planning levels from initial planning to detailed design and costing. The level of service concept provides a framework which accounts for design, cost, funding, operations and maintenance and replacement. The concept also supports a common language that can be understood by designers, engineers, municipal finance personnel, operations and maintenance staff, and politicians alike. The common language facilitates meaningful discussion and informed decision making.

It is important to note that while the Vaughan City-Wide Streetscape Implementation Manual's design focus is on the pedestrian boulevard from the curb to building frontage, the design solution is a response to the entire context of the streetscape from building face to building face.

Rationale

Streetscapes as Infrastructure

Streetscapes should be considered as part of the municipal infrastructure. The functions that streetscapes perform affect pedestrians and adjacent land uses. Like other municipal infrastructure, such as water and utilities, the functioning of streetscapes impact the ability for adjacent land uses to be successful.

Community Building and Place Making

Streets play a significant role in the vitality, livability and character of a city or neighbourhood. They are not simply a channel for vehicular movement but are urban spaces where the daily activities of a city take place. The design of these spaces is an essential element in achieving a vibrant, comfortable and stimulating city.

Streetscapes also provide one of the most essential spaces for public interaction. The comfort of an individual in a space affects their willingness and ability to interact with a fellow individual. Therefore, to foster great communities, ideal spaces of comfort need to be provided.

Community Identity, Wayfinding and Branding

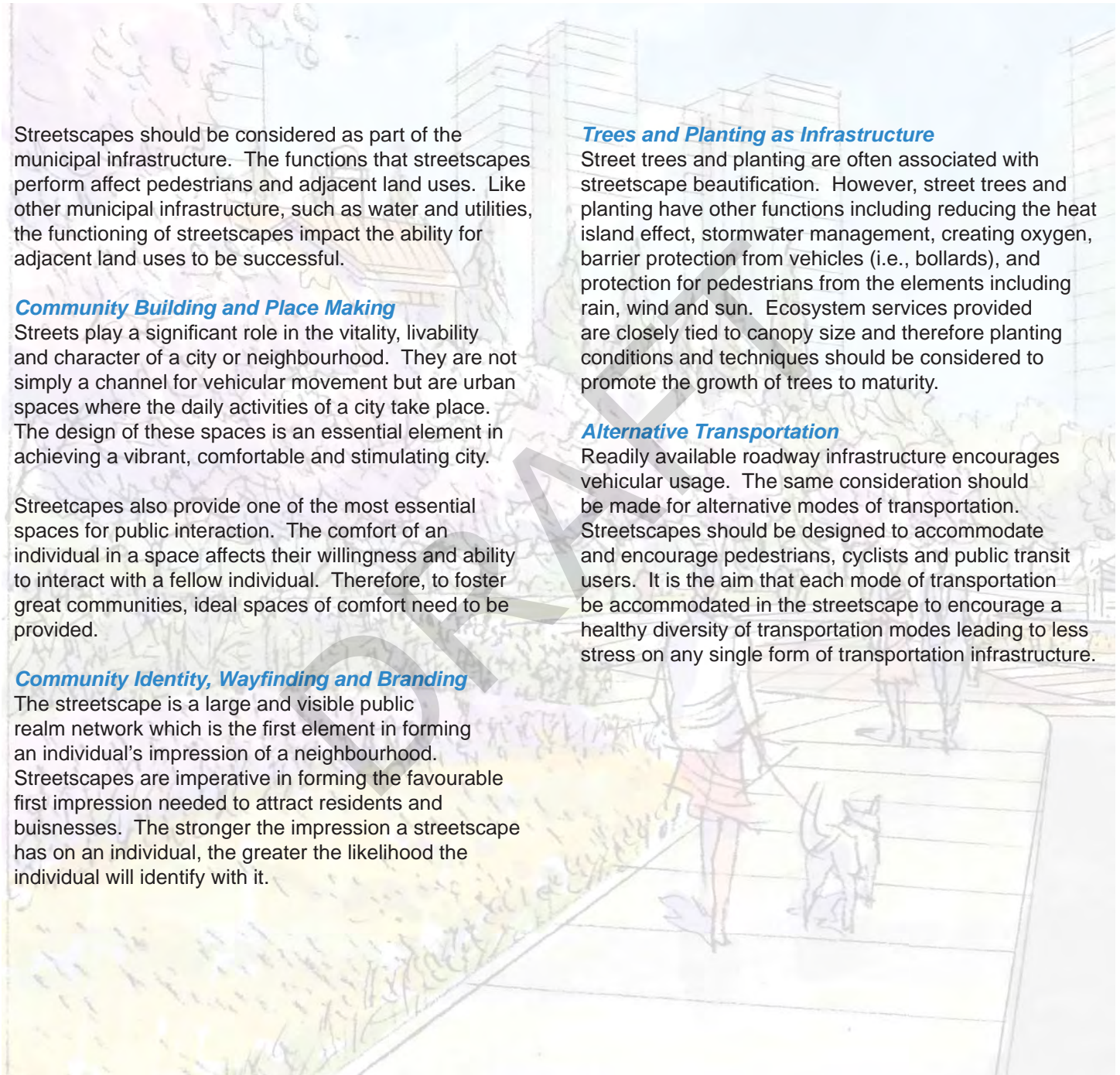
The streetscape is a large and visible public realm network which is the first element in forming an individual's impression of a neighbourhood. Streetscapes are imperative in forming the favourable first impression needed to attract residents and businesses. The stronger the impression a streetscape has on an individual, the greater the likelihood the individual will identify with it.

Trees and Planting as Infrastructure

Street trees and planting are often associated with streetscape beautification. However, street trees and planting have other functions including reducing the heat island effect, stormwater management, creating oxygen, barrier protection from vehicles (i.e., bollards), and protection for pedestrians from the elements including rain, wind and sun. Ecosystem services provided are closely tied to canopy size and therefore planting conditions and techniques should be considered to promote the growth of trees to maturity.

Alternative Transportation

Readily available roadway infrastructure encourages vehicular usage. The same consideration should be made for alternative modes of transportation. Streetscapes should be designed to accommodate and encourage pedestrians, cyclists and public transit users. It is the aim that each mode of transportation be accommodated in the streetscape to encourage a healthy diversity of transportation modes leading to less stress on any single form of transportation infrastructure.



Economic Benefits

The Vaughan City-Wide Streetscape Implementation Manual is a tool for more efficient streetscape investment in Intensification Areas and Heritage Conservation Districts.

Growth and Development

Streetscapes support growth in development. Seven of the eight goals in the Official Plan are supported by Complete Streets including Goal 3: a diverse economy and Goal 4: a vibrant and thriving downtown. The City of Vaughan is an attractive place for private investment, and will enhance its reputation by leaving a memorable impression on individuals. Given that streetscapes are experienced every day by both pedestrians and vehicular users, they are the most visible places to create an impression. Growth and development in Vaughan can be supported by good streetscape investment.

Economic Development

Benefits of streetscape investment include economic development, enhanced value of surrounding lands, quality of place and city building. Streetscape investment also leads to growth in pedestrian traffic, retail sales, achievable rents and area demand. The growth of these characteristics makes a street more desirable for investment.

Planning Efficiency and Consistency

There is also a need to clearly define the streetscape planning design and financing process. At present, the cost estimates in streetscape master plans can vary widely due to a number of factors, including:

- Assumptions
- Methods
- Components
- Materials
- Unit costs
- No operations and maintenance or life cycle costs included

The varying practices used in the preparation of cost estimates make it difficult to accurately compare and illustrate the financial implications of streetscape projects among one another and as a result, make it difficult to efficiently implement the projects. A consistent approach to streetscapes from a design and finance perspective provides better input into the planning and budget process and thus more efficiency through implementation. The accuracy and consistency of potential future financial commitments, capital, maintenance and replacement better informs the community on what it is able to fund and willing to pay. Additionally, the consistent design process supports a city-wide identity, branding the City of Vaughan to take advantage of economic development opportunities.

Seven of the 8 goals
in the Official Plan are supported by
Complete Streets



Project Background and Phasing

Every city is different. While we can learn different lessons from different circumstances, every streetscape manual needs to be researched and focused on a specific municipality. To develop the Vaughan City-Wide Streetscape Implementation Manual in a well-researched manner, the project was divided into three phases.

Phase 1 – Project Assessment of Existing Conditions

Phase 1 focused on defining the existing service level for streetscape maintenance and operations to create a baseline. The baseline is important to understand the true financial implications of streetscape enhancements during the decision making process.

Phase 2 – Research and Conceptual Approach

During Phase 2 it was important to research the possibilities and lessons learned from other municipalities. This ensures that the manual is versatile enough to address a variety of possible future development scenarios. Based upon the research, a design strategy was developed. Three levels of service were developed in this phase in conjunction with a design framework which ties into the financial model as part of the financial strategy. The streetscape types design framework and level of service concept were developed cooperatively to ensure a seamless and comprehensive streetscape planning process.

Phase 3 – Standards, Strategies and Finalization

The final phase was the development of the streetscape manual and financial strategy. The streetscape manual is a set of best practices for streetscape components building upon the details of streetscape structure, design framework and level of service. Using the level of service concept as a bridge to streetscape design, the financial strategy is built upon the elements of design, phasing and funding.

Policy

Policy at various levels of government cite the need for the public realm to support pedestrian activities and the vital role it plays in healthy and active communities. The below are examples of relevant policies for streetscapes.

Provincial Policy

Healthy, active communities should be promoted by: Planning public streets, spaces and facilities to be safe, meet the needs of pedestrians, foster social interaction and facilitate active transportation and community connectivity.

PPS Policy 1.5.1.a

Planning authorities should promote green infrastructure to complement infrastructure.

PPS Policy 1.6.2

Regional Policy

To require high-quality urban design and pedestrian-friendly communities that provide safety, comfort and mobility so that residents can walk to meet their daily needs.

The Regional Official Plan, Section 3.1 Human Health and Well-Being

Municipal Policy

Great cities can all boast of a vibrant public realm. Vaughan is committed to building a truly remarkable public realm throughout the City.

City of Vaughan Official Plan, Elements of a Great City 9.1.1

The primary consideration for enhancements to the street network are to support transit and rapid transit, cycling, walking and other alternatives to automobile use.

City of Vaughan Official Plan, Street Construction, Improvements and Maintenance 4.2.1.29

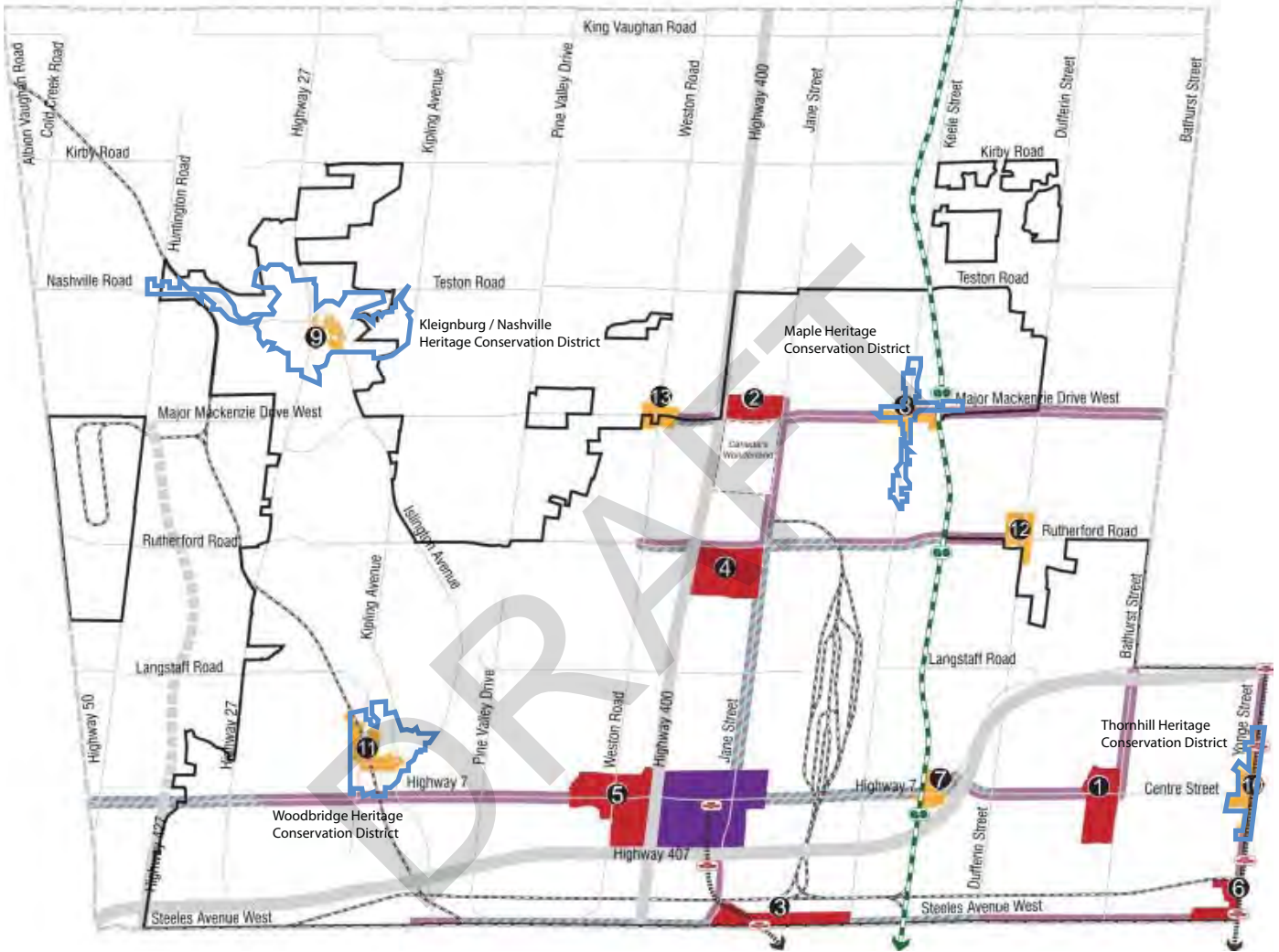
The Vaughan City-Wide Streetscape Implementation Manual is meant to be applied to all identified Intensification Areas and Heritage Conservation Districts in Vaughan.

Intensification Areas

The City of Vaughan Official Plan, directs growth to appropriate areas that can support it, including the promotion of intensification areas in the city. The Intensification Areas are classified as the Vaughan Metropolitan Centre, Primary Centres, Local Centres and Primary Intensification Corridors.

Heritage Conservation Districts

Vaughan's Heritage Conservation Districts include the historic villages of Kleinburg / Nashville, Maple, Woodbridge and Thornhill. The Official Plan recognizes and protects cultural heritage resources and promotes the maintenance and development of an appropriate setting within, around and adjacent to all such resources. The role of the streetscape in a Heritage Conservation District is to support landscape and built form character, support viable social and economic use, and to increase awareness and the cultural heritage and its significance.



Vaughan Metropolitan Centre	Primary Centres	Local Centres	Primary Intensification Corridors
	1 Bathurst & Centre St. 2 Jane St. Major Mackenzie Dr. 3 Steeles West 4 Vaughan Mills 5 Weston Rd. & Highway 7 6 Yonge St. & Steeles Ave.	7 Concord Centre 8 Historic Maple Village 9 Historic Kleinburg Village 10 Historic Thornhill Village 11 Historic Woodbridge Village 12 Carrville Centre 13 Vellore Centre	Regional: <ul style="list-style-type: none"> • Highway 7/Centre Street/ Bathurst Street • Yonge Local: <ul style="list-style-type: none"> • Jane Street • Major Mackenzie Drive • Rutherford Road • Steeles Avenue

Intensification Areas
 City of Vaughan Official Plan 2010 (as approved February 3, 2014)

How to Use the Manual

The Vaughan City-Wide Streetscape Implementation Manual can be applied from the master planning to construction stages of a streetscape design project. The manual can be used by both the City and developers through the following processes:

- [City Process](#)
- [City or Developer Process](#)

The use of each process is established by a project's place in the stages of development from master planning to construction. The City Process begins at master planning and ends with the selection of level of service and costing. The City or Developer Process begins with the selection of level of service and ends with the go ahead of construction. Both processes are connected by the level of service concept.

City Process **(Determining Level of Service)**

The City Process applies to the early stages in planning coinciding with master planning. The process is used by City staff and its main function is to determine the streetscape design concept and level of service for streetscapes. To inform the master plan, the City can determine the level of service required for each streetscape block based upon specific criteria in the manual. Knowing the levels of service for the project blocks, the information can be inputted into a financial model, prepared in conjunction with the Vaughan City-Wide Streetscape Implementation Manual to determine Vaughan's future financial commitments on the project.

Key Manual Sections:

- [Section 3](#) [Defining the Streetscape](#)
- [Section 4](#) [Level of Service Concept](#)
- [Section 6](#) [Implementation](#)

The City Process is further detailed in Section 4.

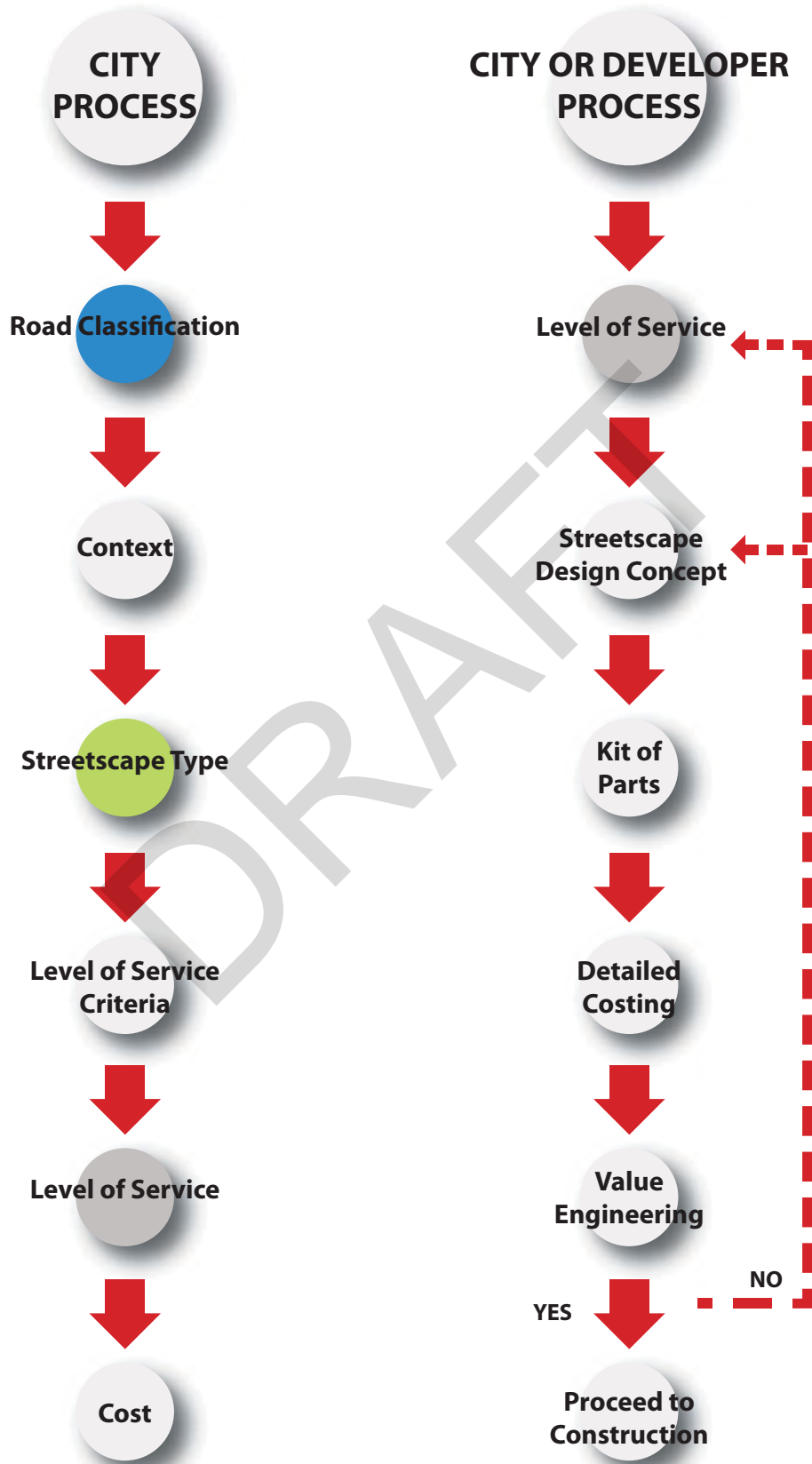
City or Developer Process **(Using Level of Service for Design)**

This process can be used by City staff or developers / designers depending on the party undertaking the streetscape project. The main function of the manual at this stage is to establish the appropriate design components per the level of service and detailed costing. Once the level of service for the streetscape blocks are determined the detailed streetscape design can be developed using the streetscape types (detailed in Section 3) and the streetscape components available for each specified level of service. Using a standard breakdown of costs (refer to the Streetscape Component Breakdown Chart found in Appendix A) associated with the streetscape components, detailed costing is established. Over the process of value engineering, if it is determined that the project requires a re-design, the design phase can start again from the point of determining level of service or a review of the streetscape design. Otherwise the project can proceed to construction.

Key Manual Sections:

- [Section 3](#) [Defining the Streetscape](#)
- [Section 4](#) [Level of Service Concept](#)
- [Section 5](#) [Streetscape Manual](#)

The City or Developer Process is further detailed in Section 5.



The City-Wide Strategy

A part of the City Process is the City-Wide Strategy. The strategy of the Vaughan City-Wide Streetscape Implementation Manual is an integration of two strategies:

- [Design Strategy](#)
- [Financial Strategy](#)

The integration between the design strategy and the financial strategy occurs through the level of service concept and allows for design and cost to work together simultaneously. The combination of the design and financial strategies help to create a financial forecast that is holistic in considering both appropriate design for context and cost.

Design Strategy

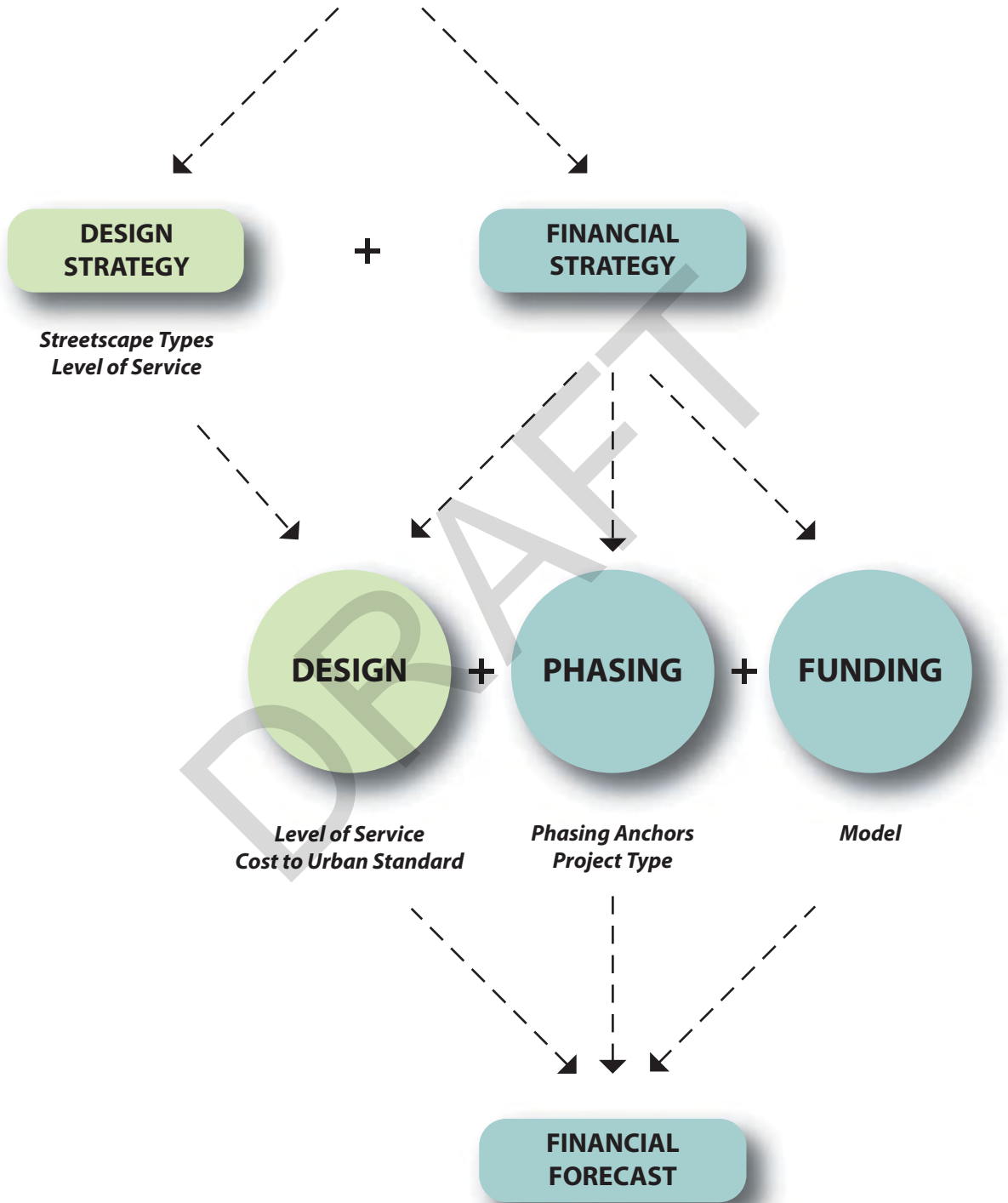
Sections 3, 4 and 5 of this manual deal with the design strategy, which aims to develop a comprehensive streetscape structure to facilitate a common streetscape language. By applying the common streetscape structure in the Intensification Areas and Heritage Conservation Districts, it becomes easier for developers and the City of Vaughan to speak on common ground in terms of acceptable design. Streetscape types and the level of service concept add further understanding between the City and developers on the functionality, appropriateness, and quality of streetscape design to respond to the context. The level of service concept is important in the design strategy as it begins to add the element of cost to design and is used to link into the financial strategy.

Financial Strategy

The financial strategy is found in Section 6 of the Vaughan City-Wide Streetscape Implementation Manual and aims to provide a tool at the early stages of master planning to forecast the financial outlook for the City of Vaughan based upon certain assumptions. The financial strategy is a combination of three elements: design, phasing and funding. The financial strategy shares the level of service concept with the design strategy as a common language. The phasing element considers the timing characteristics of individual master plan projects. The funding element deals with financial and funding processes.

A key part of the financial strategy and funding element is the financial model. The model is a decision making tool which takes key design information from master plans and the design strategy and translates the information through financial processes to forecast financial commitments and funding. The results of the model allow for designers and the City to adjust master plans at the early stages in response to the financial impact results from the model. The combination of design, phasing and funding inform the financial forecast which can be used to inform Council in the early stages of master plan projects.

CITYWIDE STRATEGY



City Decision Making Matrix

As a tool to provide information for more informed decisions, the Vaughan City-Wide Streetscape Implementation Manual identifies important decision points for the City over the process of streetscape implementation. A more detailed decision making matrix can be found in Appendix A.

Master Plan Identification

The decision to go forward with a master plan is a question of commitment. The City needs to decide if the master plan area is worth future investment based upon questions such as projected population growth, economic development potential, and whether the area is an Intensification Area or Heritage Conservation District as identified in the Official Plan.

Master Plan Financial Commitments

As a master plan progresses, the City will face the initial questions of potential affordability. With only a conceptual design the City must ask itself, can the municipality potentially afford the streetscape proposed in the master plan? The level of service concept and financial model helps the City to determine what level of design is appropriate and the potential financial commitments.

Funding and Negotiations

To facilitate coordination, it is useful to start negotiations regarding potential funding partners early in the master plan process. Potential partners could include York Region, developers, other municipalities, and transportation bodies such as the TTC and vivaNext.

Project Details

Only after some potential certainty of funding and affordability will the detailed design of a streetscape project be undertaken. The detailed design of the project offers an accurate costing based upon an appropriate design decided by the level of service.

Value Engineering

Value engineering is a question of value for investment and efficiency. Are there ways to cut costs while maintaining the integrity of the design?

Proceed to Construction

With knowledge that the financial commitments and design meet the needs of the municipality the City can decide if they will proceed with the construction.

CITY DECISION POINT

MASTER PLAN IDENTIFICATION

MASTER PLAN FINANCIAL COMMITMENTS

FUNDING AND NEGOTIATIONS

PROJECT DETAILS

VALUE ENGINEERING

PROCEED TO CONSTRUCTION

A QUESTION OF...

COMMITMENT

AFFORDABILITY

LOGISTICS

VALUE / EFFICIENCY

SATISFACTION

DEFINING THE STREETScape

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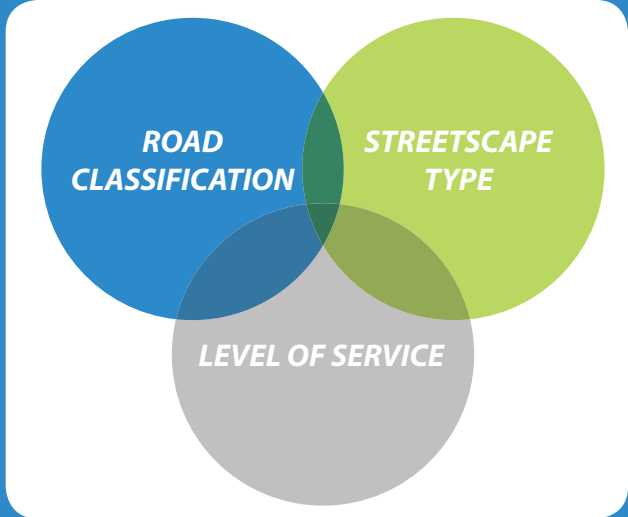




Context Sensitive Design

The structuring elements of streetscapes for the City of Vaughan are road classification, streetscape type and level of service. These elements are useful tools to understand the proper design of streets to respond both to the local context and the context of the greater regional area. It is important that the streetscape is designed with consideration of the context of the street in the overall street network, the functionality of the roadway, the functionality of the pedestrian boulevard, the adjacent land uses, and the future development of the area.

The road classification and streetscape type are useful to understand the basic function of the streetscape to provide additional guidance during the selection of design elements and funding potential. The level of service concept is described in detail in Section 4.



Streetscape Structuring Elements

The Road Classification

The engineering road classification establishes the role of the street in the overall street system of a city and region. It is characterized mostly by the structure of a roadway (for example the number of traffic lanes) and as a result has a strong focus on vehicular functions, which is moving towards a focus on multi-modal functions. The function of the roadway plays a large part in the experience of pedestrians in the streetscape. The type and ownership of streets in the overall road classification also affects the potential funding options available.

Ownership

Streets in Vaughan are either regionally or municipally owned. While most streets are municipally owned, there are examples of streets owned by the Region which play an important part in the overall connectivity of the street network. Major arterials are regionally owned while minor arterials, collectors and local streets are municipally owned. On regional roads, the municipality has jurisdiction over pedestrian sidewalks (the pedestrian clearway). While there are instances of public / private streets, this manual focuses on the public realm.

Road Classification

The road classification in Vaughan is comprised of four types of streets with five sub-categories. These include:

Arterials

- Major Arterials (typ. ROW: 45 m)
- Minor Arterials (typ. ROW: 36 m)

Collectors

- Major Collectors (typ. ROW: 26 m)
- Special Collectors (varies)
- Minor Collectors (typ. ROW: 23 m)

Local Streets

(typ. ROW: 17.5 - 20 m)

Mews

(typ. ROW: 15 - 17 m)

The function of the roadway plays a part in the experience of pedestrians in the streetscape

Key Parts:

- Major Arterial
- Minor Arterial
- Major Collector
- Special Collector
- Minor Collector
- Local Street
- Mews

Key Parts:

- Mixed-Use Commercial
- Neighbourhood
- Transit Intensification Corridor
- Technology / Office

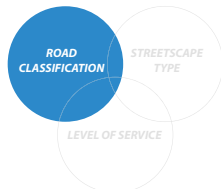
ROAD CLASSIFICATION

STREETSCAPE TYPE

LEVEL OF SERVICE

Key Parts:

- Standard Urban
- Enhanced
- Premium



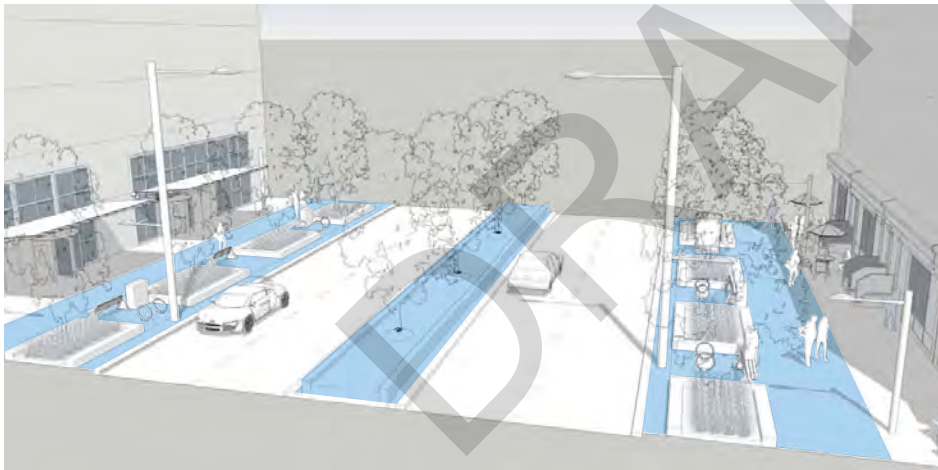
Arterials

Arterials are large streets that focus on the movement of mixed traffic at the regional and city-wide scale. These streets facilitate higher traffic speeds for longer trips, regional public transportation, and the transportation of goods. Arterials are subdivided into two categories: major and minor. Major Arterials are owned and operated by York Region. Minor Arterials are municipally-owned.

Major Arterials will be affected by the York Region's Great Streets program which is currently developing a Context Sensitive design approach to design to complete street standards and guidelines that are sensitive to the context in which the streets exist. The Region's most urbanized areas, including the City of Vaughan's Urban Intensification Areas, prioritize active transportation and public transit.

Collectors

Collectors are medium-sized municipal streets that connect the arterial street network to the local street network. Collectors are characterized by a balance of access and mobility. The three categories of Collectors are: Major, Minor and Special. Special Collectors are feature destination streets surrounded by pedestrian activity-generating land uses, and subsequently, greater emphasis is placed on supporting pedestrian, bicycle and transit activity.



Typical Arterial Streetscape



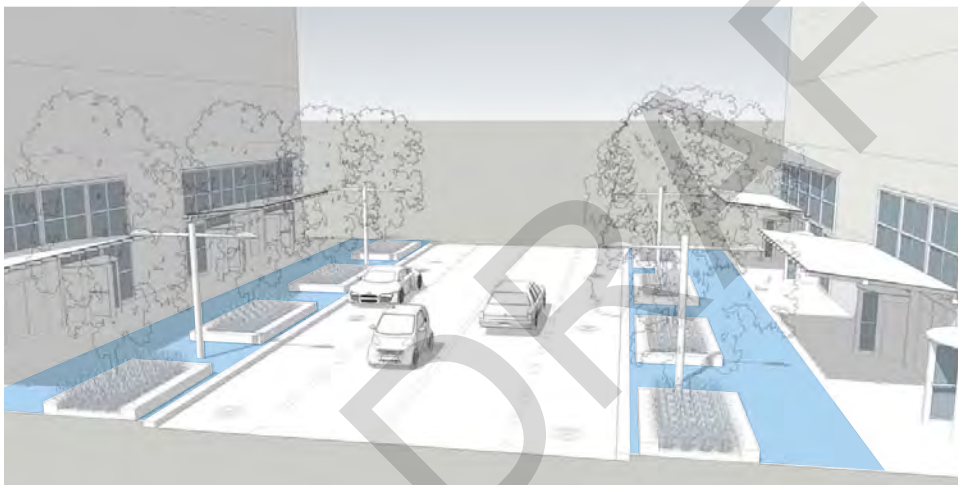
Typical Collector Streetscape

Local Streets

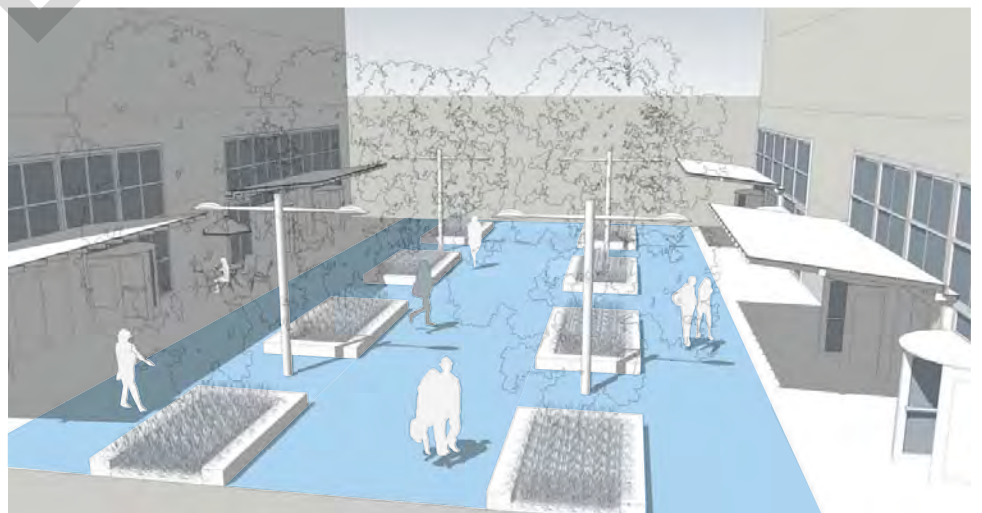
Local streets are smaller-scale municipal streets with slower speeds and provide easy access to individual properties. They generally connect traffic between collector streets and their destinations. Their smaller scale and slower speed is comfortable for walking and bicycling.

Mews

Mews are part of a public private network allowing public traffic on private development lands. Mews are pedestrian-oriented but may also be designed to accommodate vehicles. Mews are a unique opportunity to create fine grained connectivity in the overall vehicular and pedestrian network, creating versatility in the movement of vehicular and pedestrian traffic.



Typical Local Streetscape



Typical Mews Streetscape

Streetscape Types

To supplement the road classifications, streetscape types consider how streets interact with adjacent land uses and context, which influence how a street is used and experienced.

Each streetscape type prioritizes users and various design elements, with pedestrian needs and active transportation as an integral planning feature. The types and spacing of street trees, location, quantity and character of streetscape elements, types of surface treatments, sizes of areas, and lighting all affect the character and experience of a pedestrian within a streetscape. The varying requirements for streetscape components, such as bicycle stands, benches or pedestrian-scale lighting, as well as the width of a sidewalk is influenced by the land uses associated with a streetscape.

Streetscape types may change along the length of a street as surrounding land uses or road functions change.

The streetscape types identified in the City-Wide Streetscape Implementation Manual apply to urban intensification areas:

- Mixed-Use Commercial
- Transit Intensification Corridor
- Technology / Office
- Neighbourhood

York Region

York Region's Centres and Corridors Program is an integrated approach that combines the planning of urban pedestrian-friendly / walkable communities with the construction of new rapid transit lines and stations.

The Region's Great Streets program is currently developing a Context Sensitive Solutions (CSS) design approach to street design with the following goal: "To create vibrant streets for York Region that provide a range of safe and reliable transportation options while being sensitive to the adjacent land uses and the needs of the community." The Region's CSS Guiding Principles are:

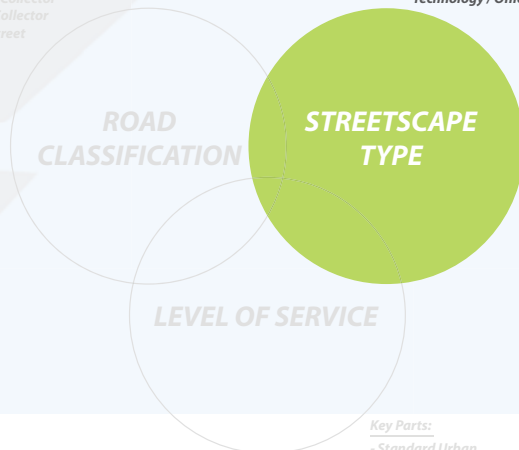
1. Tailor solutions to fit the context
2. Tailor the process to reflect the transitioning role of the road
3. Plan projects in collaboration with the local community
4. Plan for multiple transportation modes to promote sustainable, flexible solutions
5. Use sound professional judgement to determine priorities for the road design

Key Parts:

- Major Arterial
- Minor Arterial
- Major Collector
- Special Collector
- Minor Collector
- Local Street
- Mews

Key Parts:

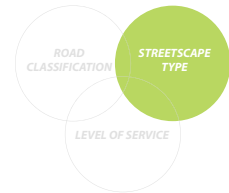
- Mixed-Use Commercial
- Neighbourhood
- Transit Intensification Corridor
- Technology / Office



Key Parts:

- Standard Urban
- Enhanced
- Premium

Streetscape types may change along the length of a street as surrounding land uses or road functions change

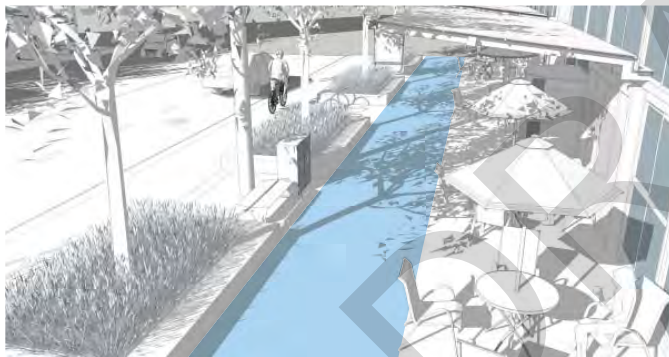


Mixed-Use Commercial

Mixed-Use Commercial represents the most active and diverse of the streetscape types being applicable in most urban scenarios. These streetscape types will accommodate high pedestrian, active and transit transportation levels including zones which call for specific interaction between the roadway and pedestrian boulevard, including passenger pick-up / drop-off streets.

Typical Context:

- Mixed-Use
- High Intensity Retail / Commercial
- High Density Residential
- Restaurants & Sidewalk Cafes
- Cultural and Entertainment
- Institutional
- Pick-Up / Drop-Off
- Mews
- Parks & Public Spaces

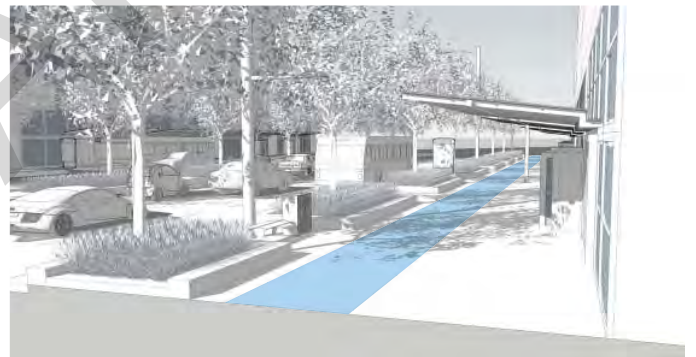


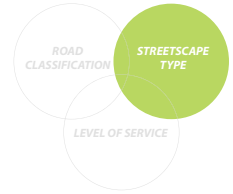
Transit Intensification Corridor

Transit Intensification Corridor streetscape types typically occur along regional arterial roads running through Urban Intensification Areas. These roads serve as regional connections between urban intensification centres for vehicular traffic. Right-of-ways (ROWs) are typically larger along transit intensification corridor streetscapes and require additional design amenities to protect pedestrians from vehicular traffic, vehicular noise and other micro-climate considerations.

Typical Context:

- Retail / Commercial / Office
- Mixed-Use
- High Density Residential
- Parks & Public Spaces
- Mews



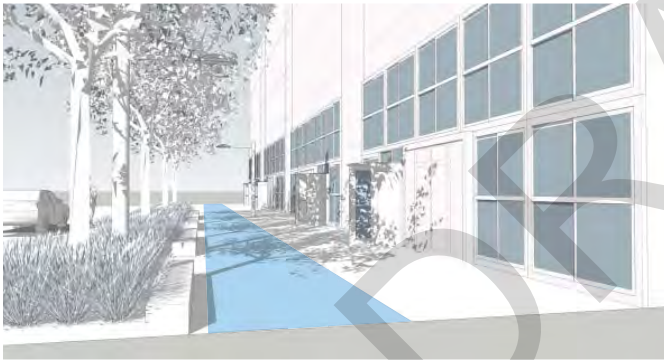


Technology / Office

Technology / Office streetscape types occur in urban employment areas fronting office, technology and commercial land uses. Lower to medium pedestrian activity and traffic generally occurs on technology / office streetscapes. Commercial truck traffic may be diverted along these streetscapes in Urban Intensification Areas requiring design provisions to address noise, water and air pollution.

Typical Context:

- Commercial / Office
- Low Intensity Retail
- Employment
- Parks and Public Spaces
- Mews
- Convention Centre / Hotel
- Institutional

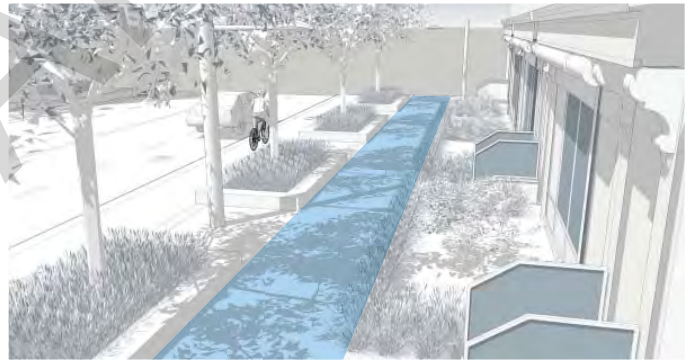


Neighbourhood

Neighbourhood streetscape types primarily front urban medium density residential land uses, parks and heritage areas. These streetscapes support local pedestrian activity, including children playing, community socializing and are designed to promote walkability. The design focus occurs at the transition across the ROW between the frontage zone (see Page 39) and either the private property or public park. While residential streets will provide a semi-public / private transition across the ROW, parks will provide seamless transition between the pedestrian boulevard and the public park.

Typical Context:

- Residential
- Local Retail
- Institutional
- Parks & Public Spaces
- Mews

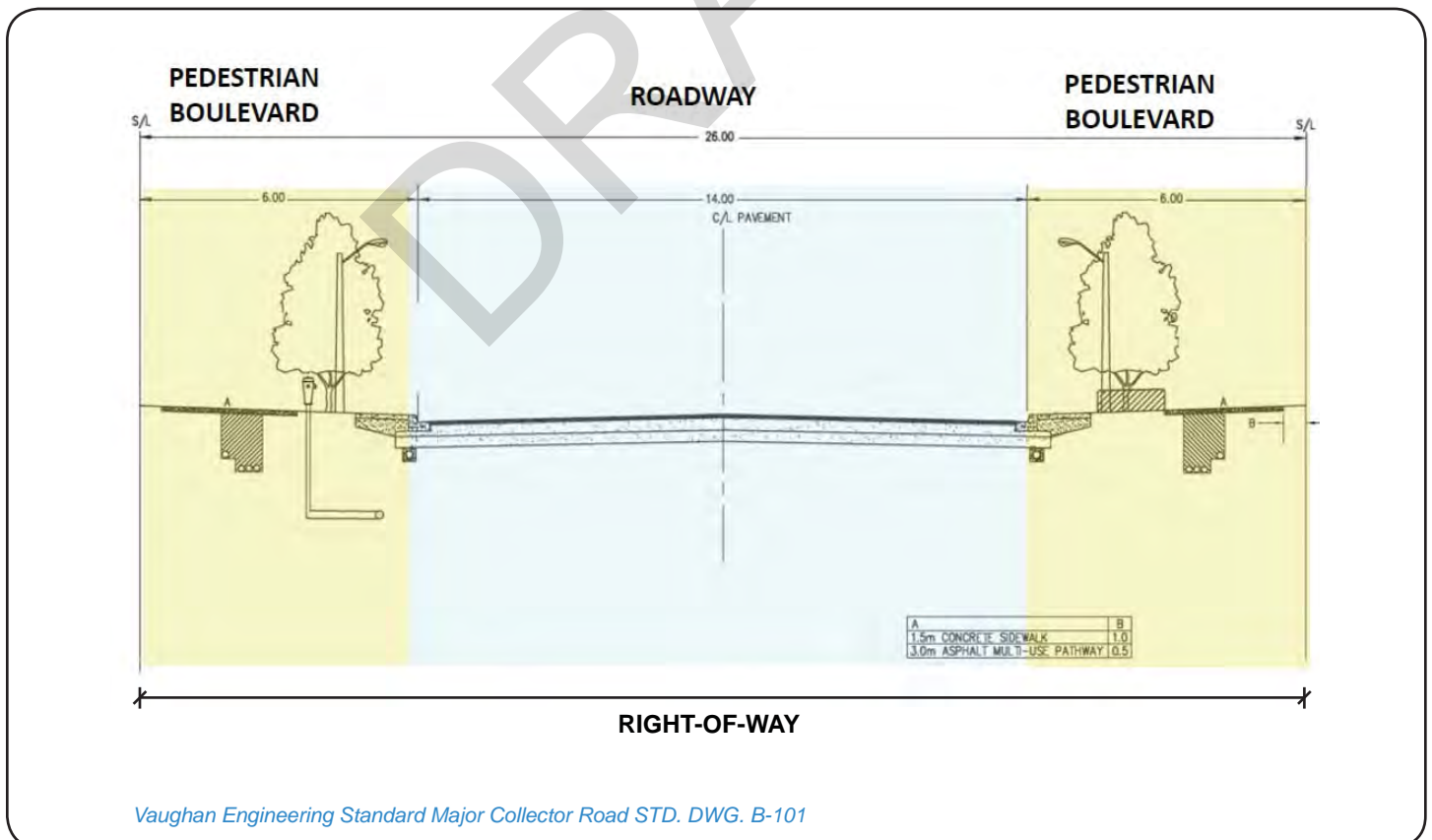


Existing Engineering Standard

A typical street, following Vaughan's existing engineering standard, is generally broken into two parts: the vehicular roadway and the pedestrian boulevard. The two parts are found within the public right-of-way which is owned by either the region or municipality.

Existing Engineering Standard

As an example, Vaughan's existing engineering standard for a typical major collector road shows 4 lanes of traffic with 2 lanes in each direction. Often the lanes closest to the pedestrian boulevard can be substituted for lay-by parking. Each lane is approximately 3.5 m wide making the roadway typically 14 m wide. On either side of the roadway are pedestrian boulevards, adjacent to the public right-of-way. The engineering standard dictates a 1.5 m concrete sidewalk or multi-use pathway in the pedestrian boulevard with lighting and trees facing a hardscaped continuity strip and roadway.



Vaughan Engineering Standard Major Collector Road STD. DWG. B-101

Roadway

The movement of transit, vehicles and bicycles are prioritized in the roadway, with the exception of flexible streets, pedestrian priority streets, or pedestrian streets. Interactions between pedestrians and the roadway occur primarily where there is on-street parking, pedestrian crossings and transit stops.

Pedestrian Boulevard

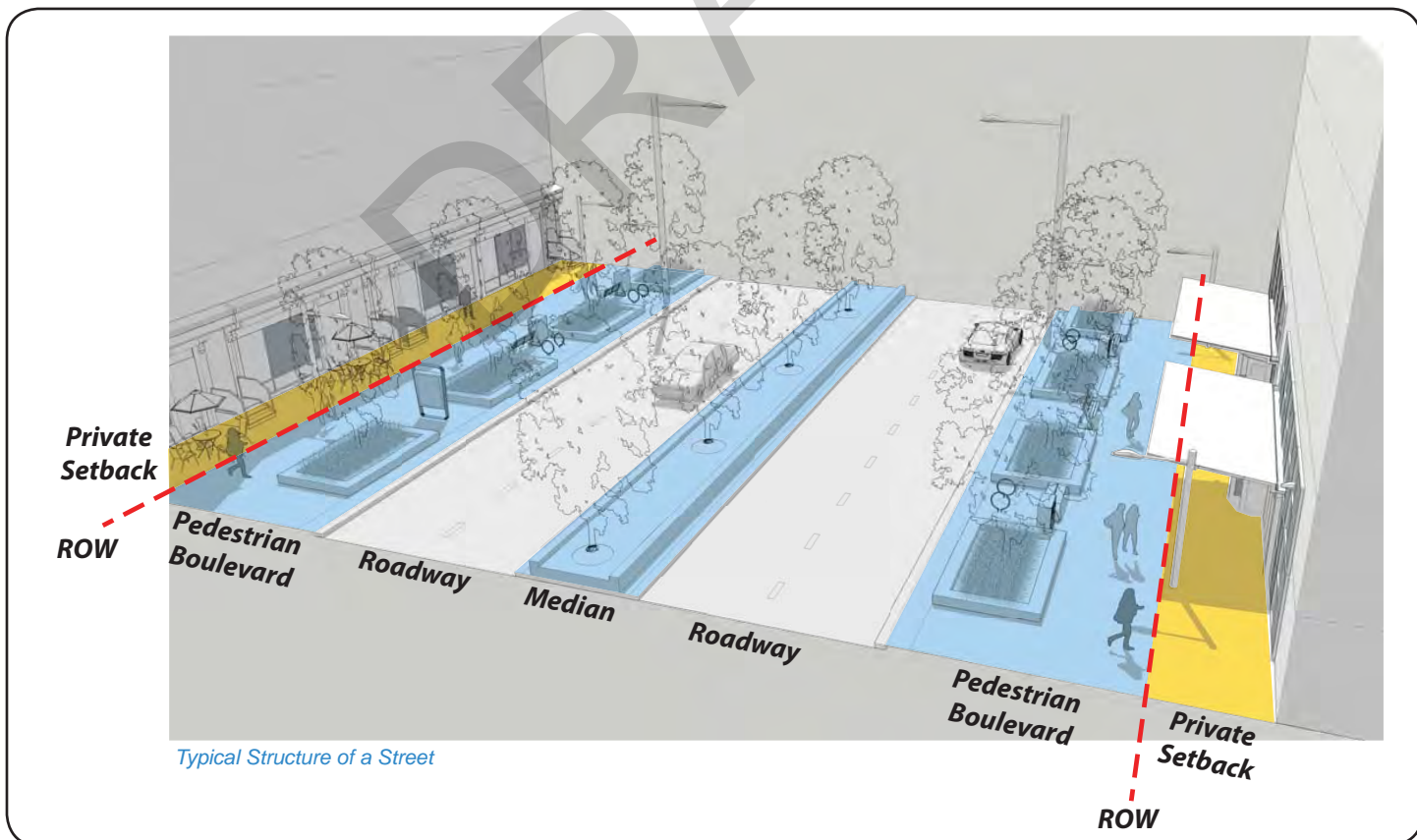
Located on each side of the roadway are the pedestrian boulevards. Vaughan’s Existing Engineering Standard shows the pedestrian boulevards to be typically 6m wide. The pedestrian boulevard is primarily for pedestrians and fulfills a variety of functions including pedestrian movement, amenities for the pedestrian transit stops, access to the roadway and to adjacent land uses, wayfinding for both pedestrians and motorists and location for utilities.

Private Setback

The private setback provides space between the building of adjacent land uses and the public right-of-way. It is useful as a transition / separation zone between the public pedestrian boulevard and private uses. Retail and services often use the setback as space for outdoor seating areas, retail displays and restaurant / cafes.

Median

The median functions mostly as a vehicular traffic separator while provided streetscape aesthetics and as a refuge for pedestrians while crossing the roadway.



Defining a Streetscape Structure

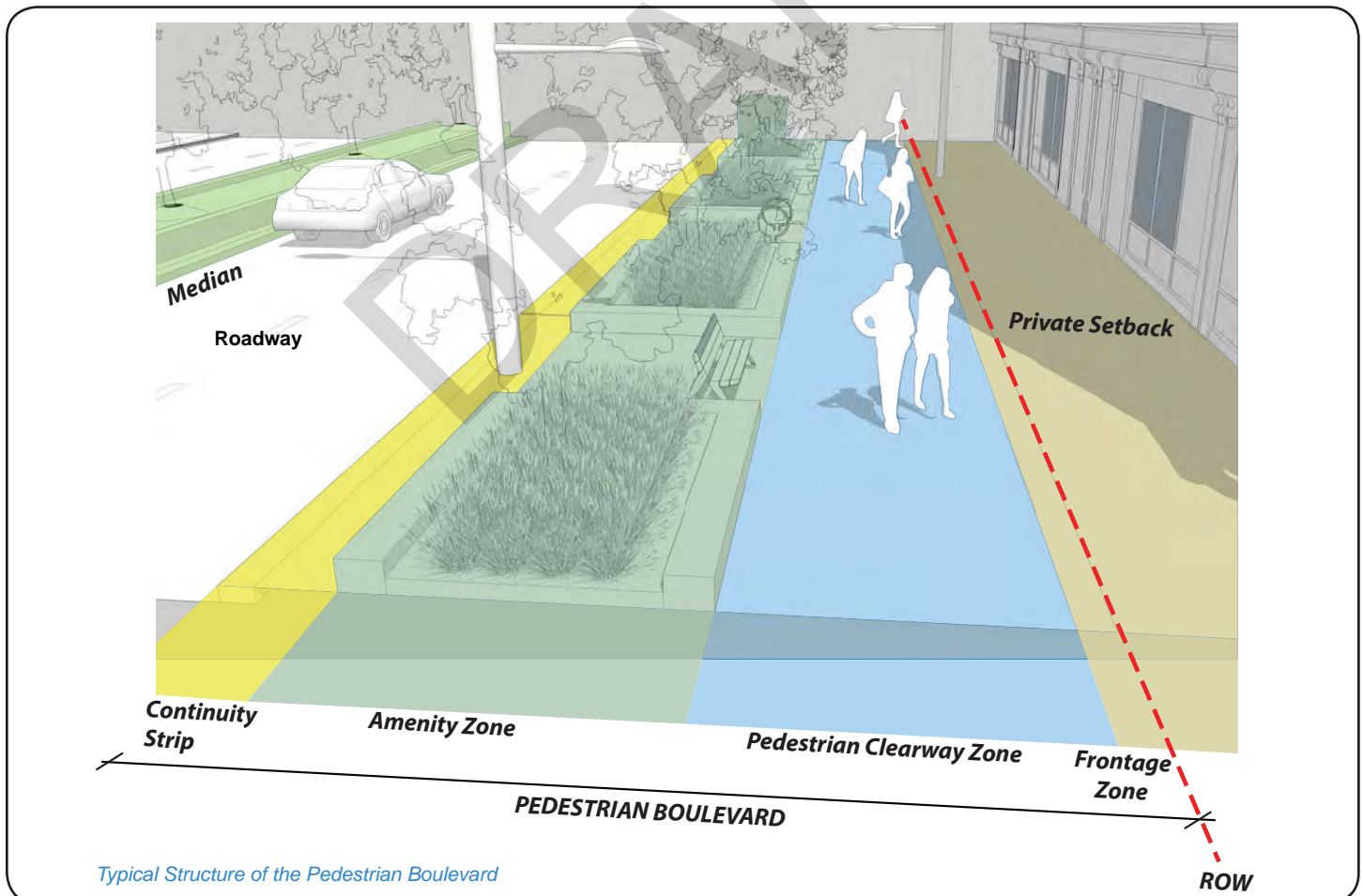
The streetscape can be separated into five zones. In the pedestrian boulevard, typically 5.5 – 6.0 m in Vaughan, is the frontage zone, the pedestrian clearway zone, the amenity zone and the continuity strip. Where applicable, the streetscape could include the median zone as the fifth zone.

Streetscape Zones

It is useful to consider the streetscape in terms of zones for ease of design. Each zone has typical widths and elements in the streetscape with room for change depending on the needs or functions of the streetscape. The streetscape elements can be chosen from a “kit-of-parts” and placed in their appropriate locations. The streetscape zones are particularly useful with regards to the level of service concept, introduced in Section 4, where a Streetscape Component Selection Matrix

(located in Appendix H) helps to determine which components are available for the determined streetscape level of service.

It should be noted that special cases arise where certain zones may not be used. For example, in areas where the right-of-way is constrained, the continuity strip or frontage zone may be excluded. In other cases, where there is more room allowed in the right-of-way, an additional amenity zone or pedestrian clearway zone may be added to accommodate the use of low impact development measures, an additional row of street trees, or a multi-use track. While these zones are typical for streetscapes, they ultimately should not limit the designer.





Seamless Transition across the Frontage Zone

Frontage Zone

Location

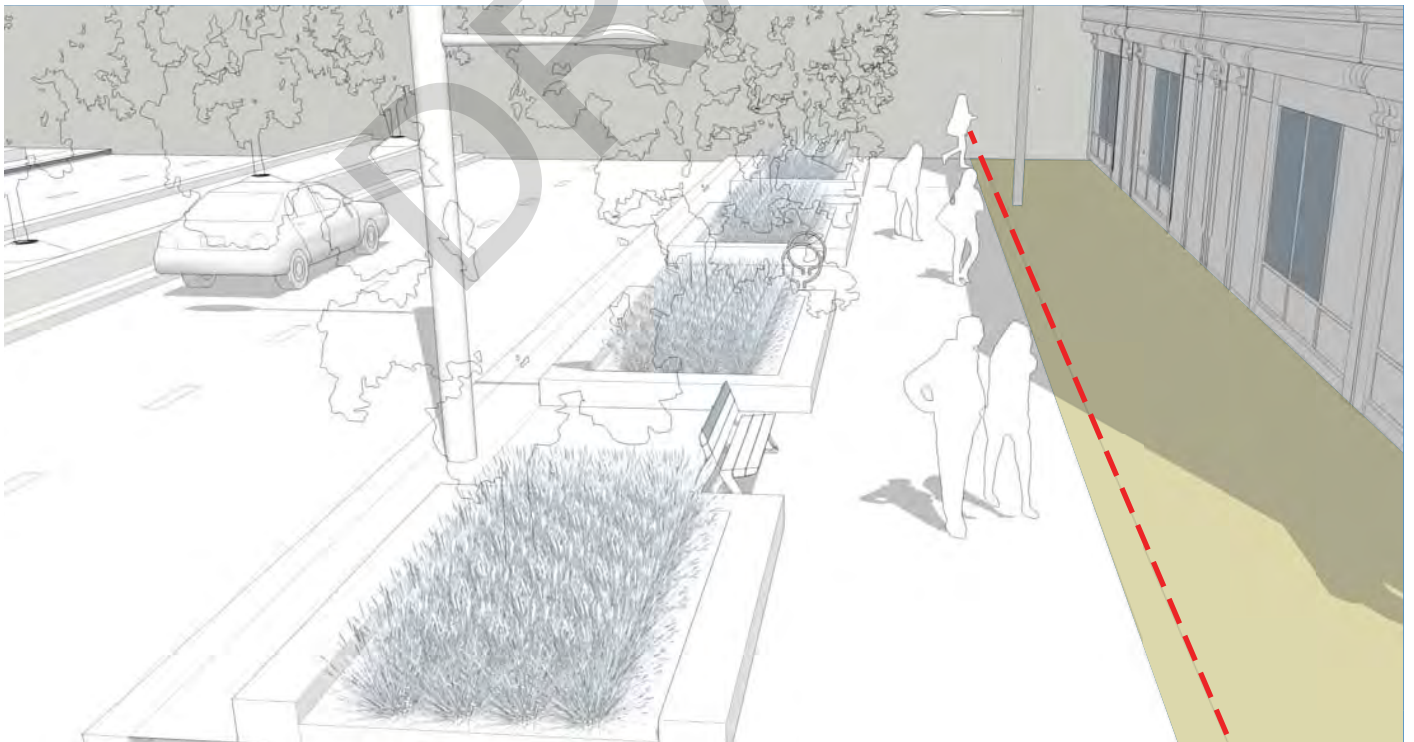
The frontage zone is located directly adjacent to the right-of-way limit and the private setback.

Description

The frontage zone is a transition zone between the pedestrian boulevard and adjacent private land uses. Hardscape or softscape elements are typically utilized in the frontage zone including concrete, unit pavers, natural stone, sod, shrubs, and grasses.

Function

The frontage zone provides a transition, separation or buffer between public and private lands. Shrubs provide a semi-transparent boundary, whereas unit paving facilitates seamless movement across the frontage zone. For example, retail uses will typically benefit from a seamless transition between the pedestrian sidewalk and the retail fronts to welcome customers. In other cases, planting may be used to provide privacy in residential land uses.



Frontage Zone

Pedestrian Clearway Zone

Location

The pedestrian clearway zone is located typically between the amenity zone and the frontage zone.

Description

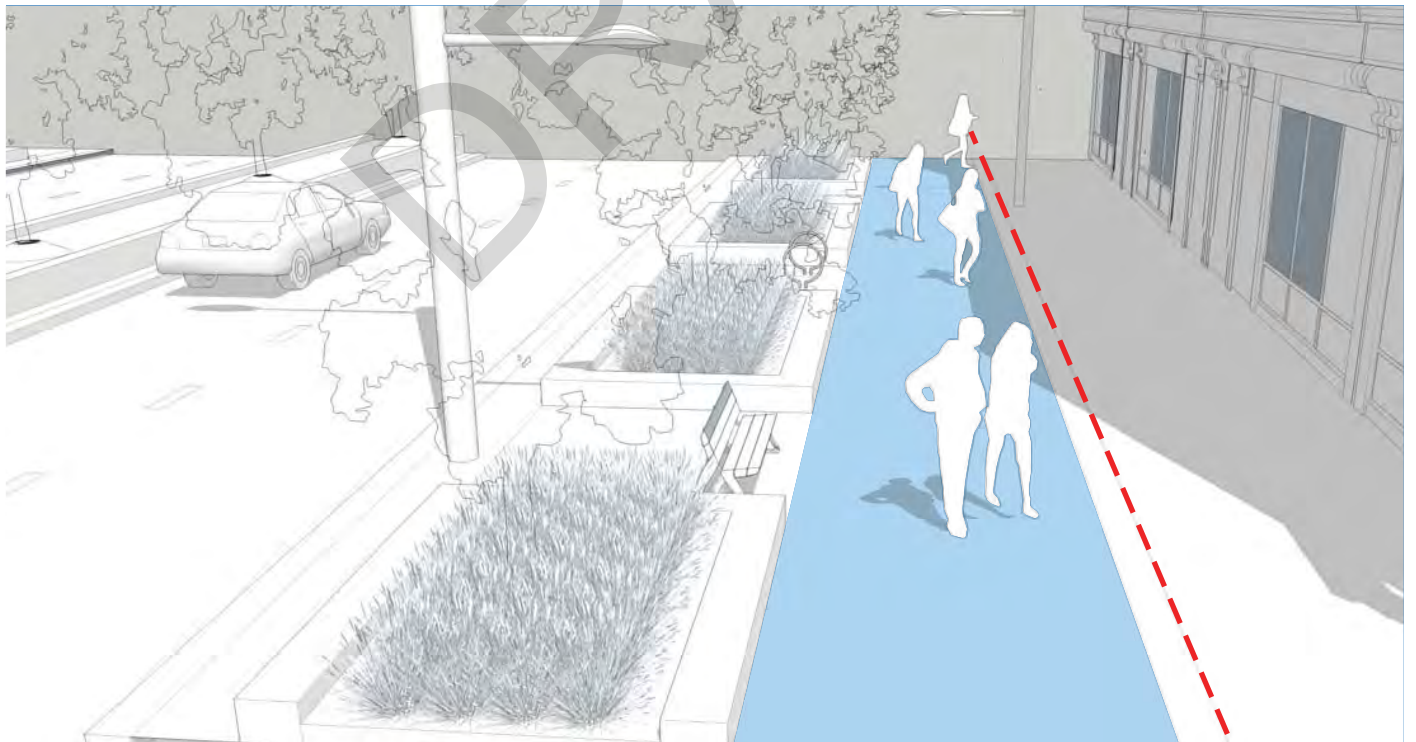
The main organizing element in the pedestrian boulevard is the pedestrian clearway zone, otherwise known as the sidewalk. The pedestrian clearway zone is typically made up of paving materials such as concrete, unit paving or natural stone.

Function

The function of the pedestrian clearway is to facilitate pedestrian movement and traffic with a path clear of obstructions and obstacles. The pedestrian clearway can be used as a design reference relating to adjacent land uses. For example, retail streets require larger pedestrian clearways to support higher pedestrian volumes and activity. In special cases, the pedestrian clearway zone may be connected seamlessly into public spaces to read as single large spaces.



Pedestrian Clearway Zone with Accent Paving over Amenity Zone



Pedestrian Clearway Zone



Amenity Zone

Amenity Zone

Location

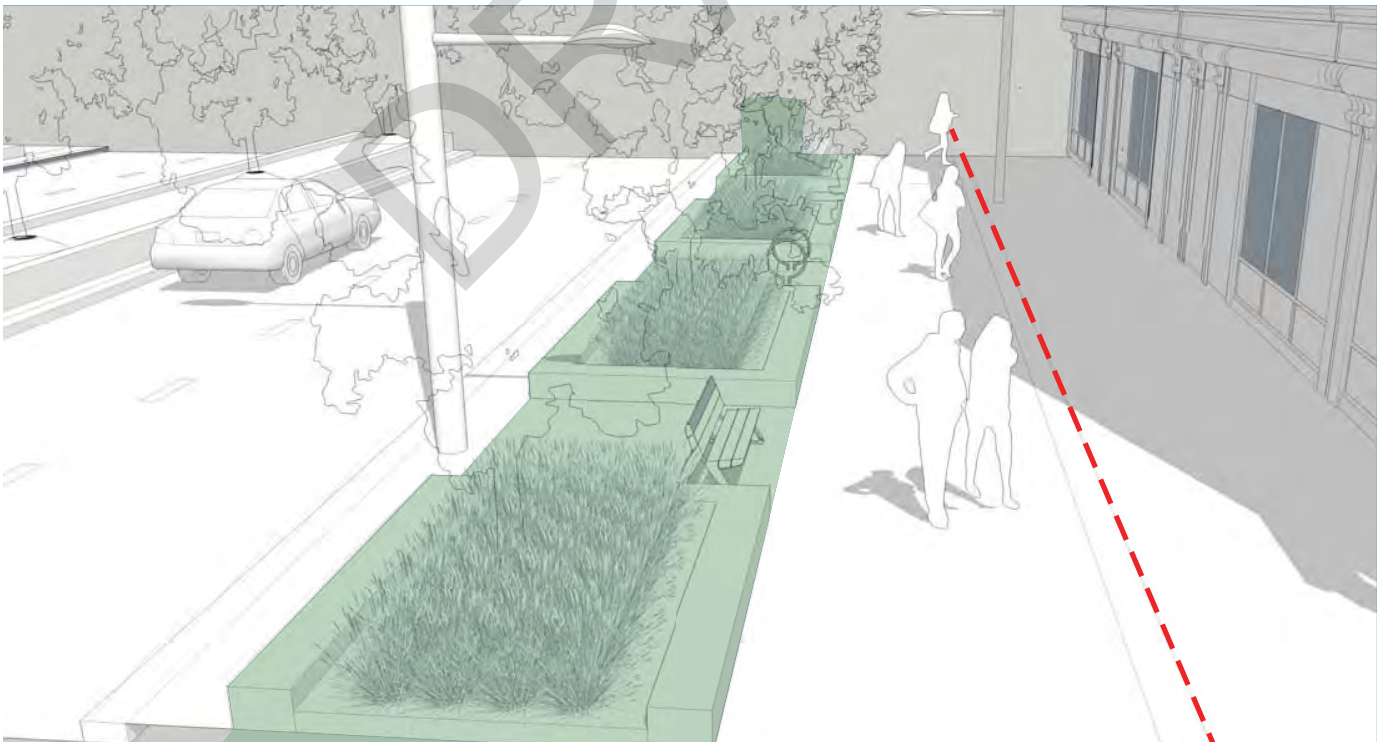
The amenity zone is typically located between the pedestrian clearway and the continuity strip zone.

Description

The amenity zone plays a large part in determining the character of the streetscape. The amenity zone may be sodded or paved and may include items such as street trees, street and pedestrian lights, planters, perennials and ornamental grasses, benches, waste receptacles, information kiosks, bicycle stands, and low impact development measures.

Function

The function of the amenity zone is to provide visual, functional, and environmental pedestrian amenities. The amenity zone may also act as a buffer between pedestrians and the vehicular roadway. Specialized streets may also contain additional amenity zones such as green streets with double rows of trees. Additional amenity zones are dependent on right-of-way restrictions.



Amenity Zone

Continuity Strip Zone

Location

The continuity strip zone is located between the amenity zone and the vehicular roadway.

Description

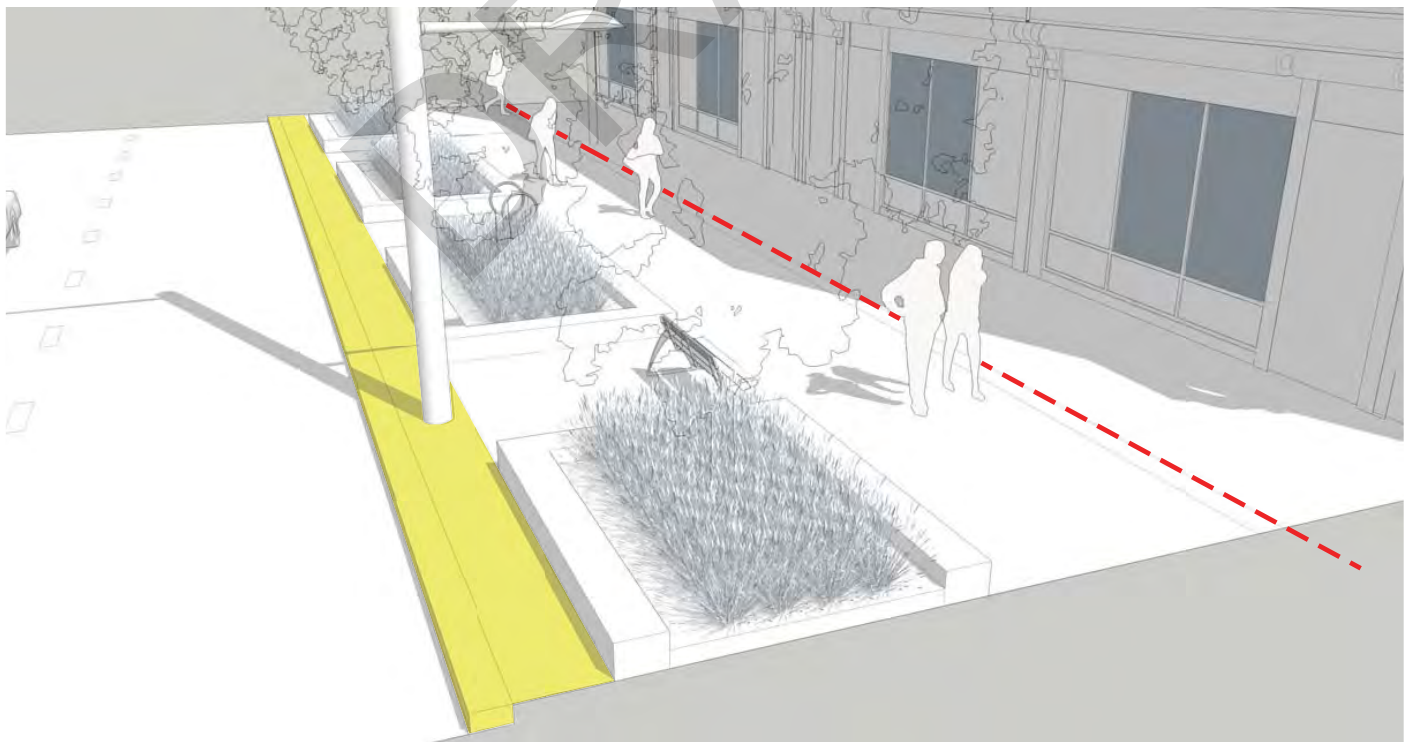
The continuity strip is a relatively small strip in the pedestrian boulevard and may be treated with softscape (sod) or hardscape (unit paving or poured in place concrete).

Function

Located next to the vehicular roadway, the continuity strip provides a safety clearance for the doors of parked or idling vehicles so they do not interfere with furniture and planters in the amenity zone. The continuity strip provides potential space for street lights, wayfinding signage and utility poles. In addition to the road curb, the continuity strip helps to define the division between the roadway, the pedestrian boulevard, and the rapid clearway (if adjacent to a bike lane on the street), and provides an area for snow storage.



Continuity Strip Zone



Continuity Strip Zone



Median with Seatwall Planter

Median

Location

Medians are located in the middle of the vehicular roadway between opposing traffic directions.

Description

Medians are separate entities from the pedestrian boulevard and typically do not carry pedestrian traffic parallel to the roadway. Medians can come in different forms from thin concrete barriers to wide vegetated areas. In large roadways acting as signature avenues and boulevards of cultural importance, the median may become a large public space with monuments, public art and seasonal / temporary installations, paving and planting.

Function

The function of the median is to separate vehicular traffic going in opposing directions. For pedestrians, the median provides opportunities for visual stimulation and refuge while crossing particularly large roadways. The median zone can also be utilized as left turn lanes at traffic intersections.



Median

Intersections

The general condition in a streetscape is the segregation of vehicular traffic and pedestrian traffic by the streetscape zones and elements. Intersections are locations where the paths of perpendicular roadways cross. At the intersection, the normal streetscape separation is eliminated with vehicular and pedestrian traffic coming into direct interaction. Cyclists, a third mode of transportation, crossing the intersection interact with both vehicles and pedestrians. Pedestrians are most vulnerable at these locations, which highlights the importance of intersection treatment. As the streetscape character of the street blocks change, intersections provide a transition point from one streetscape type to another.

As the streetscape character of the street blocks change, intersections provide a transition point from one streetscape type to another.

Structure

When designing intersections four areas need to be considered:

- Mid-block condition
- Transition zone
- Pedestrian corner treatment
- Crosswalk

Mid-Block Condition

Mid-block conditions are the general conditions of the streetscape where the vehicular roadway and pedestrian boulevard are parallel. Pedestrian and vehicular traffic is separated with generally minimal interaction.

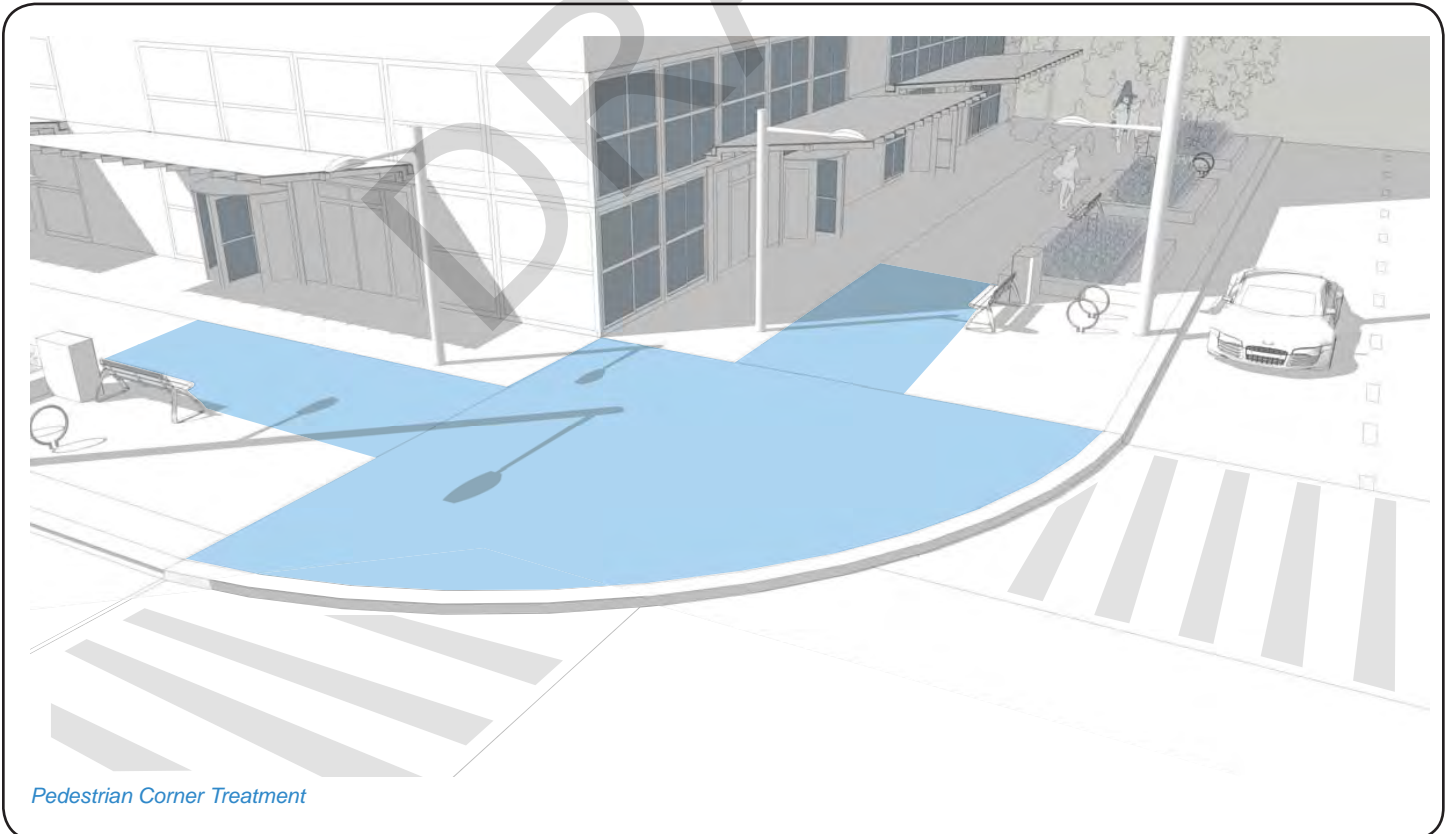
Transition Zones

Transition zones combine with the pedestrian corner treatment to form the intersection in major intersections. Transition zones are located between the mid-block condition and the pedestrian corner treatment. In the transition zone, the rhythm of street trees, paving materials and patterns change in character to signal to pedestrians they are approaching an intersection where more attention is required.



Pedestrian Corner Treatment

Pedestrian corner treatments make up the entire intersection in minor intersections, but are combined with a transition zone in major intersections. The pedestrian corner treatment is located at each corner of crossing roadways providing a refuge area for pedestrians to await crossing the roadway to reach the other side. Pedestrian corner treatments are typically treated with hardscape paving materials and make ideal locations for public art and public space. Proposed softscape and planting should promote seasonal interest, xeriscape principles and accommodate winter snow removal operations and storage.



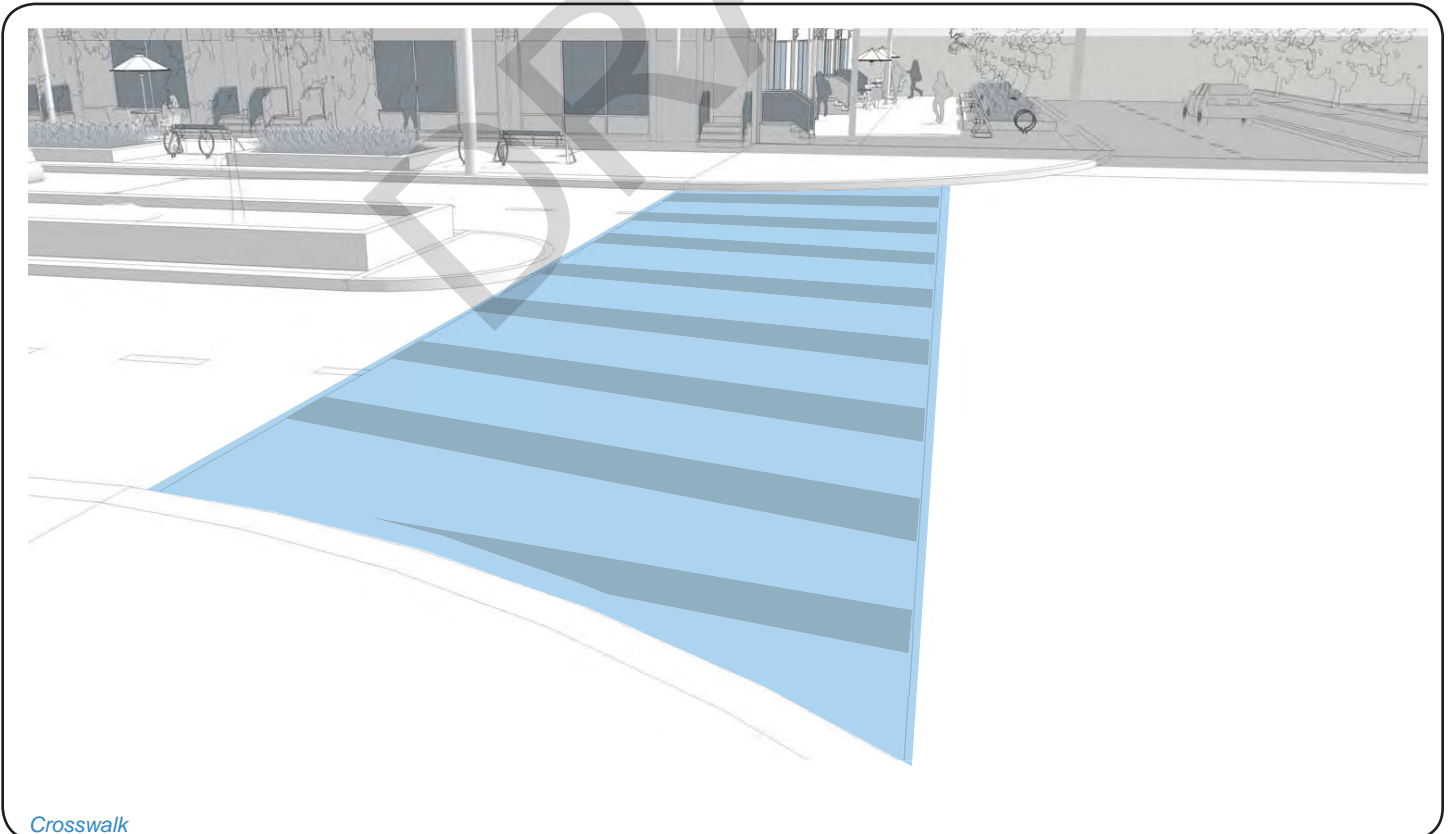
Pedestrian Corner Treatment

Crosswalks

Crosswalks are located directly on the vehicular roadway and run perpendicular to the direction of vehicular traffic. The crosswalk is where the pedestrian is most vulnerable. The purpose of the crosswalk is to clearly indicate to both pedestrians and vehicles where pedestrians are allowed to cross the roadway. The clear delineation of the crosswalk is done through painted lines on the asphalt, different paving materials, printed patterns, and raised crosswalks.



Crosswalk with Coloured Pattern and AODA Tactile Paving



Crosswalk

Intersection Types

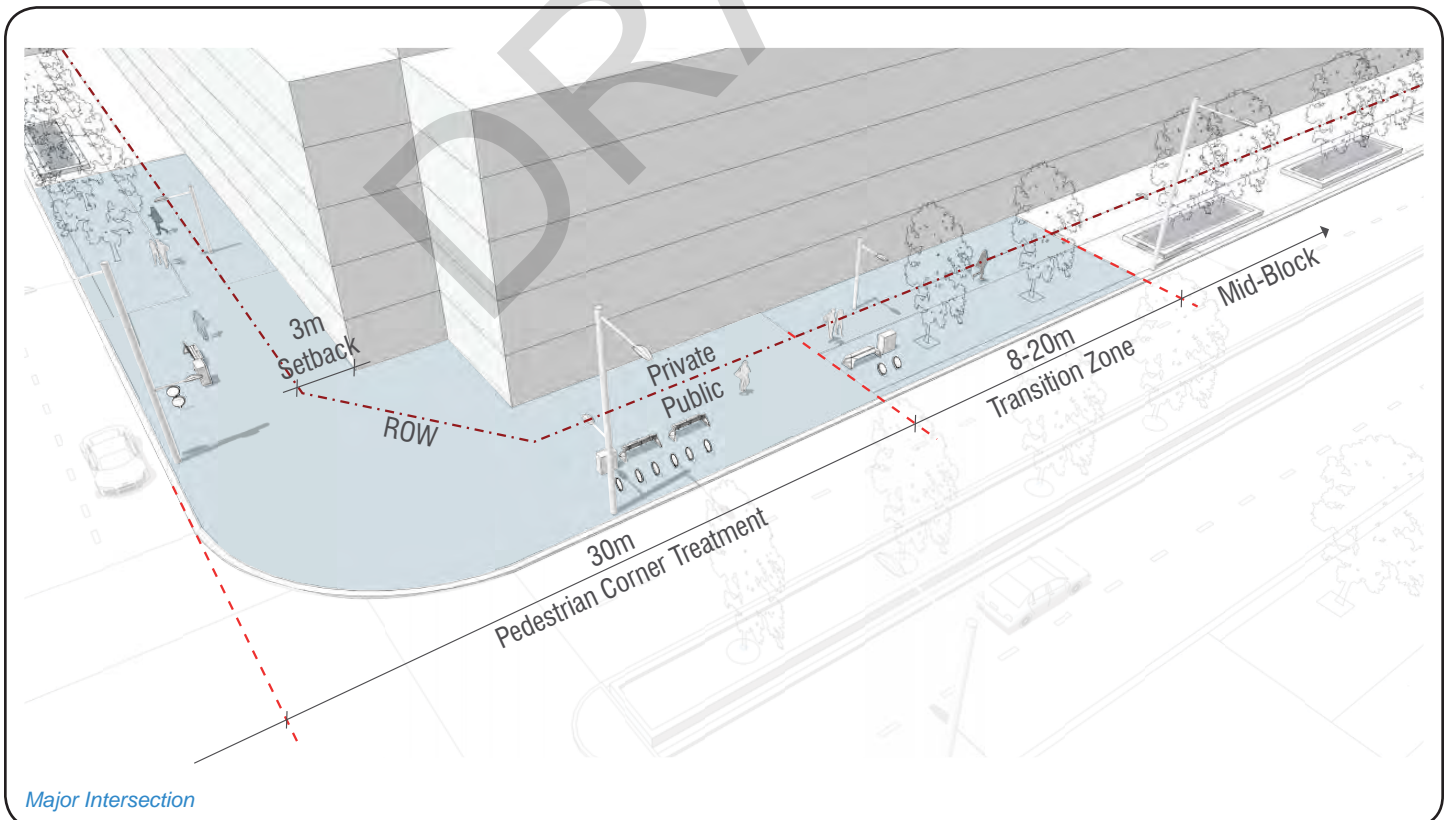
The delineation between the intersection and mid-block differs based upon the type of intersection. There are two main types of intersections:

- Major intersections
- Minor intersections

Gateway intersections are a sub-type of major intersections.

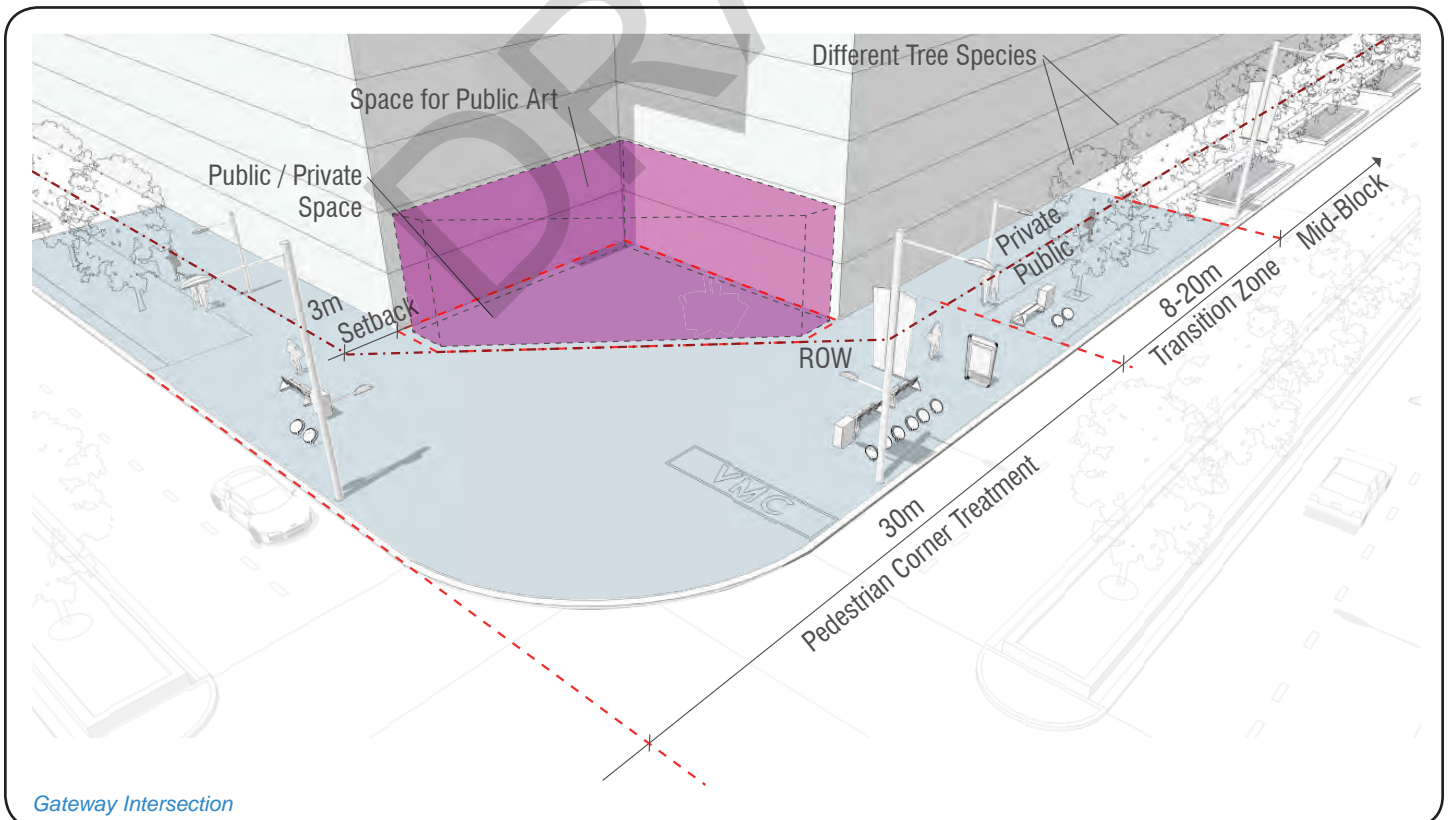
Major Intersections

Major intersections are typically found in locations where two major roads with high vehicular and / or pedestrian traffic cross. The crossing roads in major intersections can be of cultural or regional value or are arterial roads with large right-of-ways and many lanes of vehicular traffic. The wide right-of-ways and busy vehicular traffic in major intersections create a scale larger than characteristically comfortable for the pedestrian realm. A transition zone is added between the mid-block condition and intersection condition as an outcome of the large scale. Major intersections have a pedestrian corner treatment area of approximately 30 m from curb and a transition zone which varies from approximately 8m to 20 m. This means that the mid-block condition starts from approximately 38 m to 50 m from the intersection curb. It should be noted that VIVA standards call for an approximately 65 m intersection. However, this condition is only effective with large block sizes found in places such as Highway 7.



Gateway Intersections

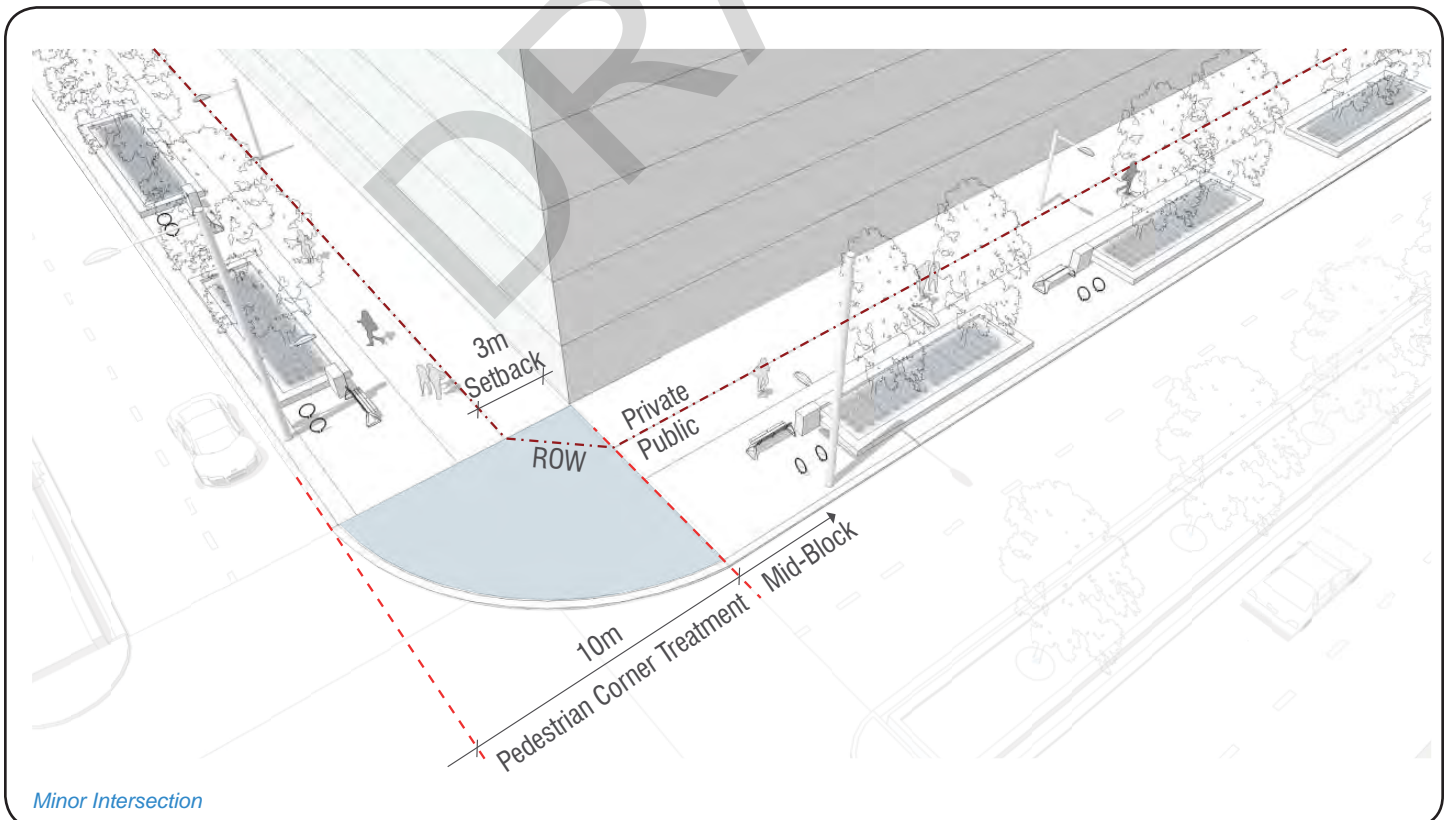
Gateway intersections share the same structural framework as major intersections within the ROW. Gateway intersections differ from major intersections by having specific branding elements in the streetscape including character district branded pavers, branded banners on street poles and branded street furniture. Buildings located at gateway intersections should provide space for a public / private zone within the private setback zone which could include public art and other public activities.



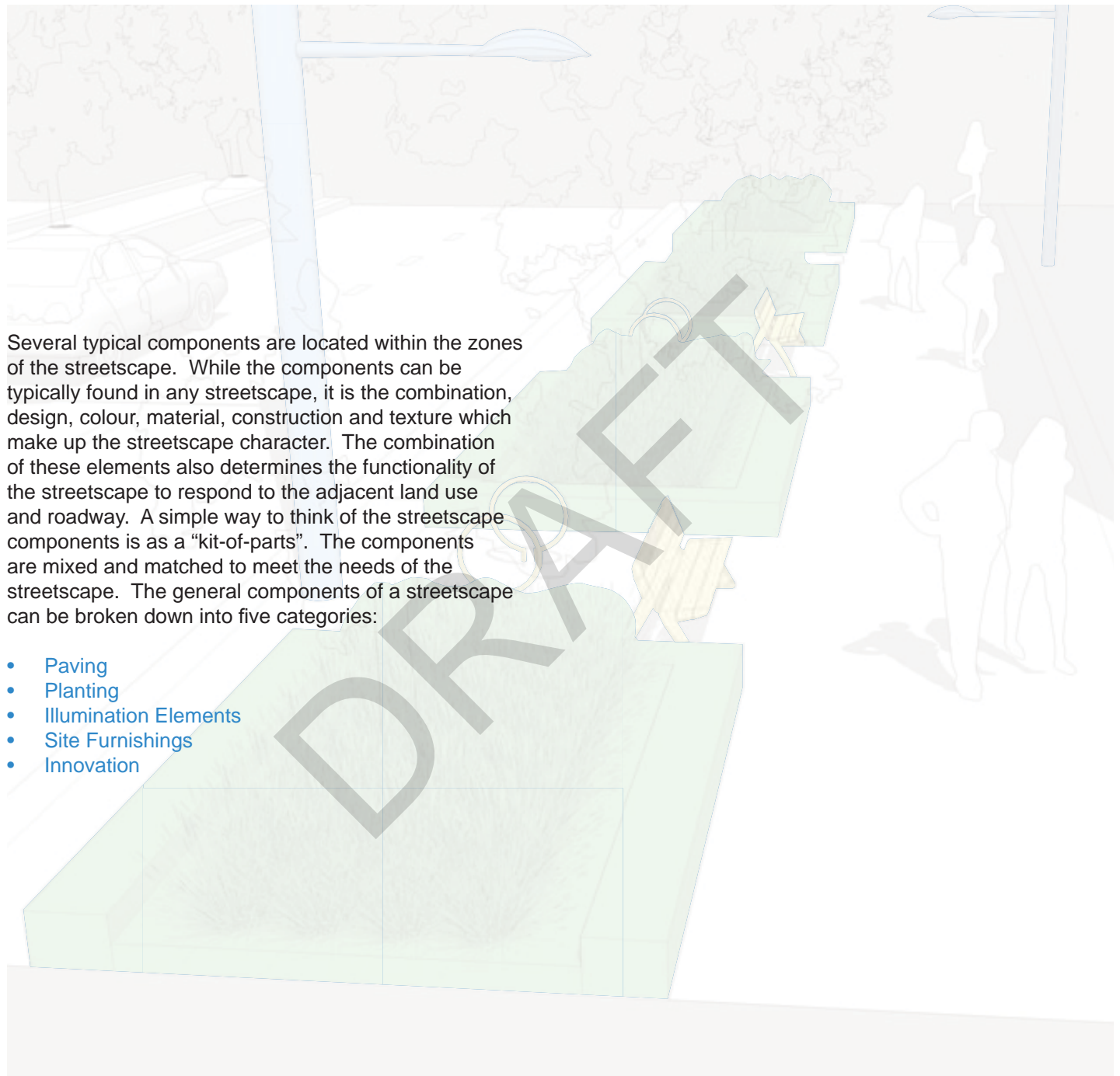
Gateway Intersection

Minor Intersections

Minor intersections are smaller in scale than major intersections but still can have a high volume of pedestrian traffic. They do not typically have the high vehicular volumes of major intersections and are more favourable to the pedestrian scale. There is no transition zone found in minor intersections due to the smaller scale. The pedestrian corner treatment of minor intersections measure approximately 10 m from the curb to mid-block condition depending on context and scale.



Components



Several typical components are located within the zones of the streetscape. While the components can be typically found in any streetscape, it is the combination, design, colour, material, construction and texture which make up the streetscape character. The combination of these elements also determines the functionality of the streetscape to respond to the adjacent land use and roadway. A simple way to think of the streetscape components is as a “kit-of-parts”. The components are mixed and matched to meet the needs of the streetscape. The general components of a streetscape can be broken down into five categories:

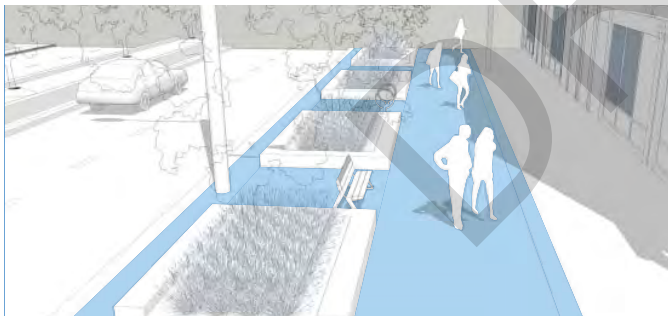
- Paving
- Planting
- Illumination Elements
- Site Furnishings
- Innovation

Paving

The most prevalent of the streetscape components is paving, otherwise known as the hardscape. Paving provides a flat surface, which is easily maintained, that can be easily navigated by pedestrians and easily used to define areas and zones. The most common location for paving is in the pedestrian clearway zone (i.e., the sidewalk). However, in an urban setting, paving is also commonly found in the continuity strip, amenity zone, frontage zone and median. Paving is often divided into ‘field paving’ and ‘accent paving’, where field paving represents the most predominant material and colour, while accent paving provides additional design and definition. Paving designs are a simple and effective way to define the zones in the streetscape.

Typically paving materials include:

- Poured-in-place concrete
- Precast unit pavers on concrete base
- Precast unit pavers on granular base
- Permeable paving
- Natural stone
- Tactile paving



Planting

Planting represents the main visual amenity component found in the streetscape. Planting is generally used to create a visually appealing and comfortable pedestrian environment and act as a buffer from vehicular traffic. Planting plays a large part in forming the character of a streetscape. In an urban context, planting is mostly found in the amenity zone; however, in a low density context it can be found in all of the other zones, with the exception of the pedestrian clearway. Sod or grass often replaces paving as a ground element in low density areas. Street trees are one of the most utilized streetscape planting elements and provide a number of functions beyond the aesthetic, including providing shade and a buffer from the vehicular roadway.

Typical planting components include:

- Street trees
- Sod
- Shrubs
- Perennials and ornamental grasses
- Seasonal planting
- Tree grates
- Planters

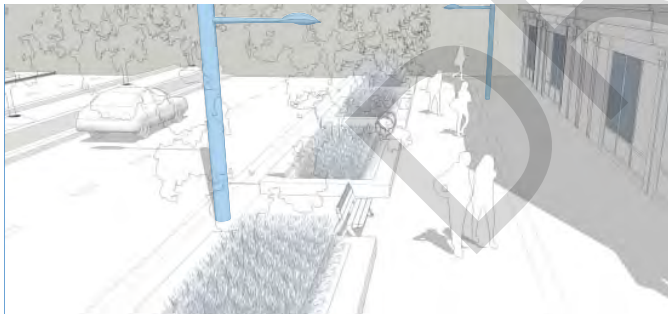


Illumination Elements

The most common and basic illumination elements are street lights. In general, lighting is a safety feature providing illumination for pedestrian and vehicular movement during the night. Street lights are primarily concerned with roadway illumination. Pedestrian lights provide security, safety from hazards, wayfinding and decorative functions for urban areas where there are pedestrians likely to be traveling the streetscape at night. Pedestrian lights may be installed on pedestrian scaled poles or in combination with street light poles. Accent or specialty lighting can add additional safety to the streetscape and provide versatile visual aesthetics. Street lighting is generally found in the continuity strip or amenity zone, while pedestrian lights can be found in the amenity zone or frontage zone.

Illumination elements can include:

- Street lighting
- Pedestrian lighting
- Bollard lighting
- Paving lighting
- Accent lighting
- Seatwall lighting
- Tree up-lighting
- Wall wash lighting

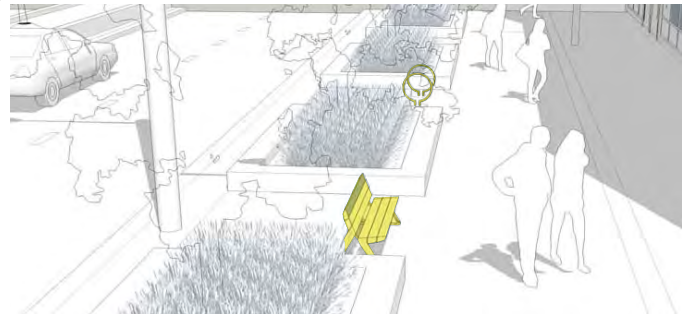


Site Furnishings

Site furnishings are generally physical streetscape amenities as opposed to aesthetic amenities. Benches provide places for pedestrians to sit and rest, while waste receptacles provide places for refuse to keep the streetscape clean. Bicycle stands provide parking for active transportation, similar to lay-by parking for vehicles. Site furnishings, mostly located in the amenity zone, vary depending on the level of pedestrian activity in the streetscape.

Typical site furnishings include:

- Bench
- Waste receptacle
- Bicycle stand
- Banners
- Wayfinding signage
- Bollard

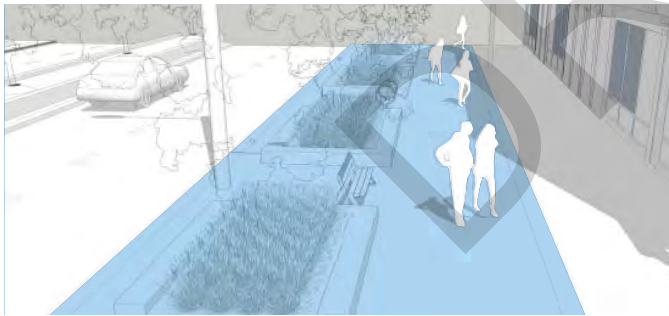


Innovation

The purpose of innovation components is to include a broad range of non-typical state-of-the-art elements as part of the streetscape. These include unique installations and infrastructure which have not been implemented before in Vaughan. Innovation components are often part of pilot projects to test feasibility and impact on the streetscape. The most common innovation components include low impact development measures such as storm water management rain gardens, bioswales and bio-retention ponds. Innovation components are not limited to the two described above and can include a wide variety of innovative initiatives.

Potential innovation components include:

- Low impact development measures
- Public art
- Digital media and communication installations
- Flexible street design with rolled curbs
- Planting strategies

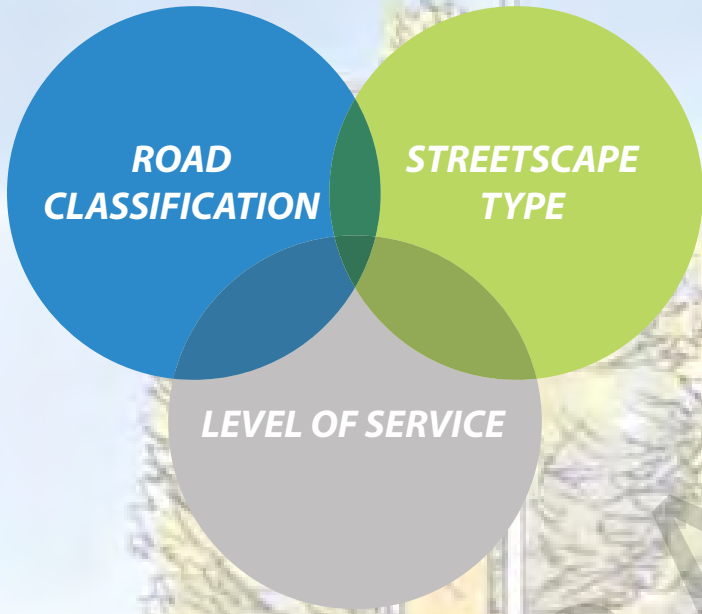


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LEVEL OF SERVICE CONCEPT





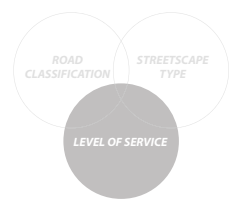
As introduced in Section 3, there are three structuring elements to streetscapes in Vaughan:

- Road classification
- Streetscape type
- Level of service

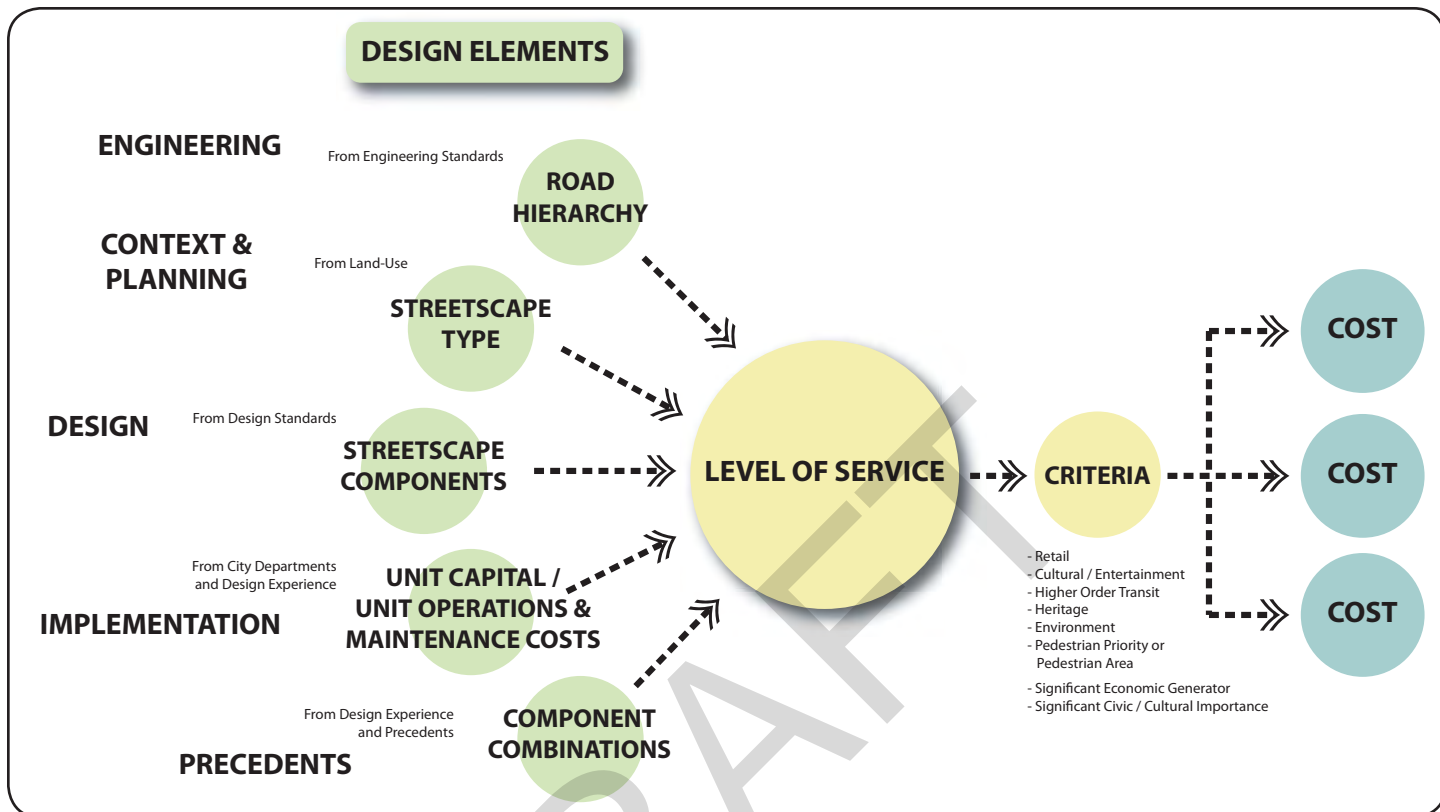
Road classification and the streetscape type define streets in the high level planning and land use planning context. In the past, level of service was associated with the roadway and vehicular traffic, simply considering the ability of a roadway to effectively move traffic flow and meet transportation needs. Complete streets encompass the entire streetscape and all modes of transportation. The Vaughan City-Wide Streetscape Implementation Manual applies a level of service concept to the pedestrian boulevard design which responds to the context and functional needs of a street for all modes of transportation. For example, on streets with pick-up / drop-off zones the pedestrian boulevard must be designed to safely interface with idle zones, cycle facilities and ensure the safety of the pedestrians from the adjacent land uses. The pedestrian boulevard is designed as the common element connecting adjacent land uses and the roadway while serving the complete street.

The streetscape level of service is focused on the pedestrian boulevard and the pedestrian experience relative to the road classification and streetscape type. With these in mind, level of service goes on to further consider the economic aspect of streetscapes. Capital costs and potential funding for streetscapes are important to understand from an implementation point of view. Streetscapes cannot be realized without knowing the capital construction cost and where funding will come from. Even more important is the future year-to-year financial commitment of a municipality for operations and maintenance costs. Consequently, the level of service concept aids as a tool to understand streetscapes from the functional, design and economic perspectives.





Design Driven



Level of Service is Holistic and Design Driven

The level of service concept consolidates concerns from engineering, urban planning, designers, operations and maintenance, municipal finance and politicians. While design driven, this concept is a tool to address the balance between design, function and cost in a single language.

The importance of the concept is the ability to categorize a response to the adjacent land use while maintaining design versatility. The level of service concept provides a simple way of understanding the design and financial differences between subsequently higher quality streetscapes. It creates a “prototype” to understanding streetscape construction and planning.

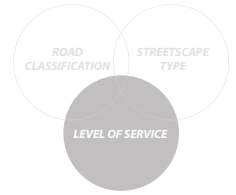
There is a historical suburban standard and three main prototype levels of service. Each fundamental level of service represents a subsequent increase in design quality, versatility, pedestrian comfort / amenity and capital cost. The levels of service are:

- Basic (Existing)
- Standard Urban
- Enhanced
- Premium

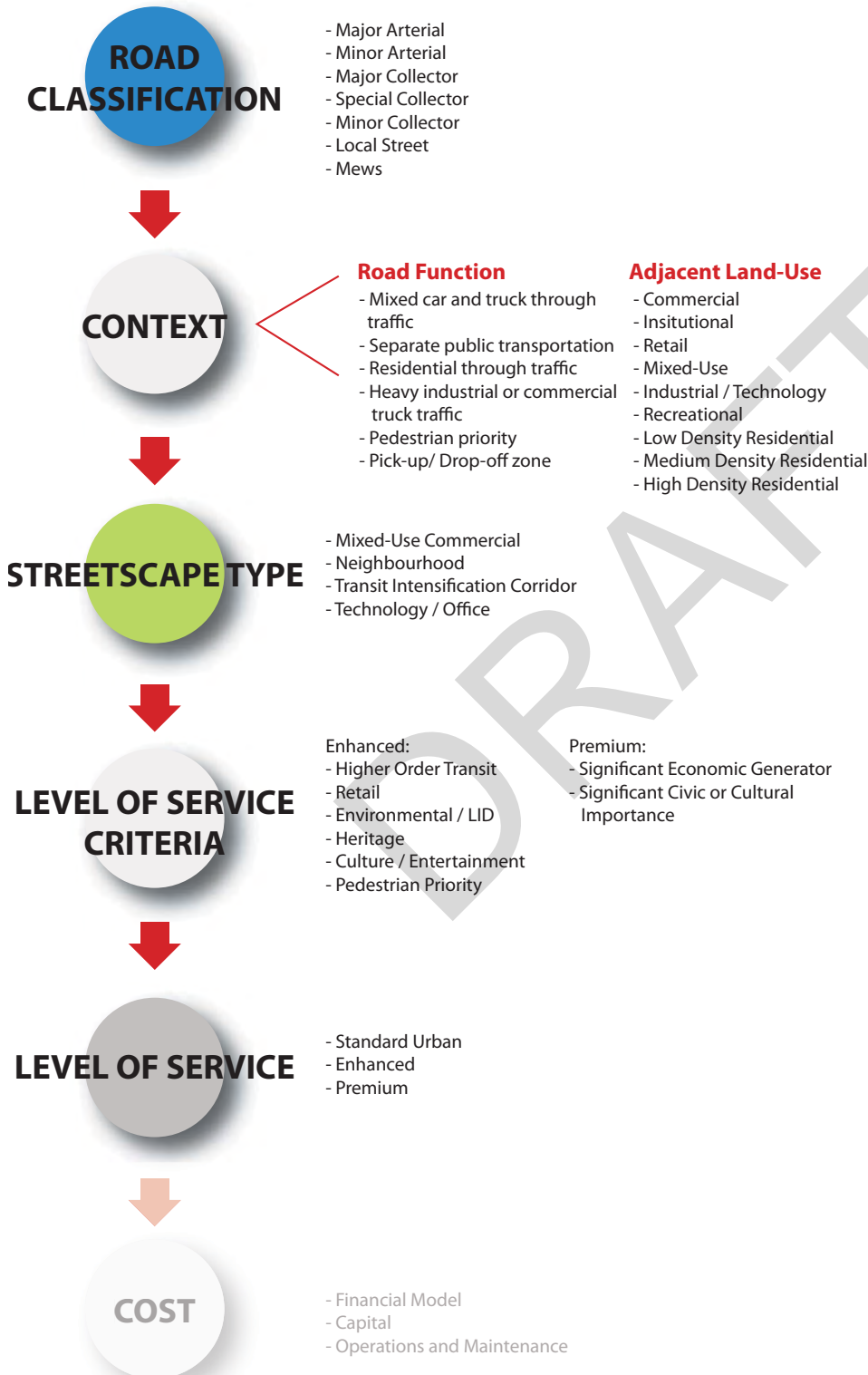
The major collector road section in the Vaughan Engineering Standards represents the Vaughan existing historical standard and is used as the base reference point (see Section 3). The base reference streetscape standard is known as the Basic level of service and is a suburban streetscape design, generally not suitable for Vaughan’s Urban Intensification Areas or Heritage Conservation Districts. By modifying the basic level of service softscape into hardscape materials, an “urbanized” version of the basic level of service is created and known as the Standard Urban level of service for urban applications.

The following research, found in Appendix H / I / J, were used to develop the level of service concept:

- [Streetscape Component Selection Matrix](#)
- [Streetscape Component Breakdown Chart](#)
- [Operations and Maintenance Chart](#)



Determining Level of Service

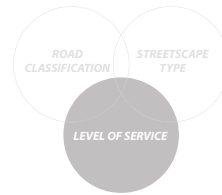


City Process

As introduced in Section 2, the City Process starts from the master plan stage to determining the level of service for a streetscape. It is associated with six steps which also includes the use of the financial model, developed in conjunction with the Vaughan City-Wide Streetscape Implementation Manual.

For every block, from intersection to intersection and for each side of the street, the first five steps must be followed to determine the level of service for the streetscape. Intersections are unique transition points between different streetscape characters and are therefore not a part of the level of service determination.

At each step, a choice must be made from a series of potential inputs to collectively determine the level of service of a streetscape. Each choice at each step has an impact on the next step's choice. The City Process is explained here to the level of service determination of a streetscape. The final step, determining cost, is explained in Section 6 in conjunction with a financial model.



Road Classification

To determine the level of service of a streetscape the designer must first consider the roadway. The street classification of the roadway partly determines the function of the vehicular roadway but also the jurisdiction. This is an important input into the financial model and has implications for financial funding and commitments. Roads can be classified as:

- Major Arterial (Regional Jurisdiction)
- Minor Arterial (Municipal Jurisdiction)
- Major Collector (Municipal Jurisdiction)
- Special Collector (Municipal Jurisdiction)
- Minor Collector (Municipal Jurisdiction)
- Local Street (Municipal Jurisdiction)

Context

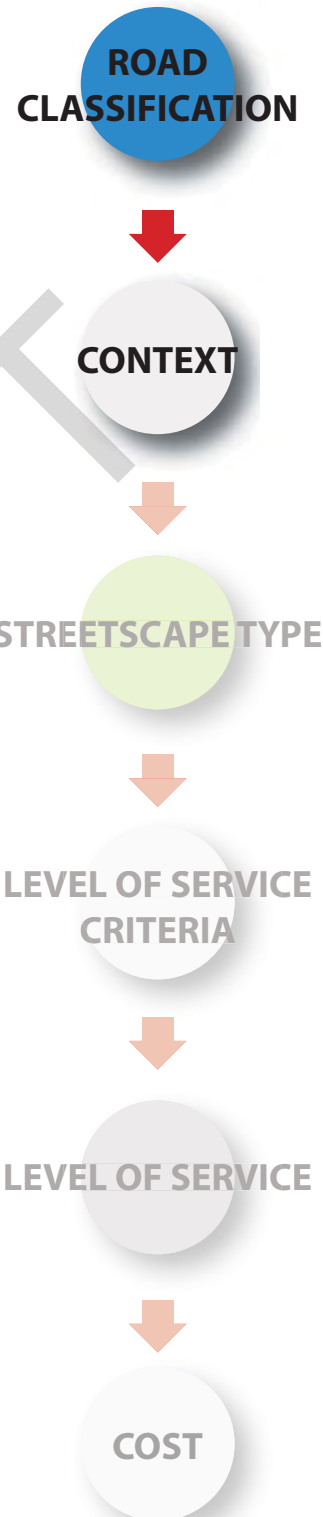
Context is governed by both the roadway function and adjacent land use. Both the roadway and adjacent land use functions have an impact on the pedestrian boulevard. The functions of the roadway and adjacent land use determine the design response of the streetscape and therefore determines the streetscape type. For example, roadways that are transportation truck corridors or vehicular corridors will have a high volume of vehicular traffic and impact pedestrians in the pedestrian boulevard. The streetscape design response would need to provide a buffer between the roadway and pedestrians. Alternatively, an adjacent land use of retail would require a seamless transition between the pedestrian clearway zone and the retail frontage to encourage retail activities.

Roadway function considerations include:

- Vehicular Corridor
- Transport Truck Corridor
- Public Transit Priority
- Pick-up / Drop-off Zone
- Flexible Street

Adjacent land-use considerations include:

- Commercial
- Institutional
- Retail
- Mixed-use
- Industrial / Technology
- Recreational
- Low Density Residential
- Medium Density Residential
- High Density Residential



Streetscape Type

The streetscape type represents the design response to the context of the roadway function and adjacent land use. Section 3 describes each streetscape type and their associated context. The four streetscape types are:

- Mixed-Use Commercial
- Transit Intensification Corridor
- Technology / Office
- Neighbourhood

Level of Service Criteria

All streets start at a Standard Urban level of service. For a streetscape to qualify for a higher level of service the streetscape must consider a number of criteria. Two sets of criteria represent special context situations which determine an upgrade to an Enhanced or Premium level of service. Streetscapes warranting an Enhanced level of service have the presence of the following criteria:

- Retail
- Culture / Entertainment
- Higher Order Transit
- Heritage
- Environmental
- Pedestrian First

Premium levels of service will have the presence of Enhanced criteria, but additionally are:

- Significant Economic Generators
- Of Significant Civic / Cultural Importance

The level of service criteria are explained in greater detail on the following pages.

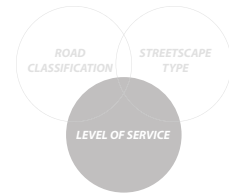
Level of Service

The streetscape level of service is then finalized with the application of the upgrade criteria. Each level of service has an associated prototype cost which is found in the financial model.

Cost

Costs are determined by the inputs of each step into the financial model including phasing and funding considerations. Alternatively, multiplying the per linear meter cost of each level of service by its associated block length yields a simple cost estimate based upon design.





Enhanced Level of Service Criteria

Enhanced level of service streetscapes are pleasant and comfortable streets with more focus on the pedestrian realm. To upgrade a streetscape from an Standard Urban level of service to an Enhanced level of service, any one of the following criteria must be met. Streetscapes meeting more than one criteria are more justified.

Retail

Retail designated streets typically have a higher volume of pedestrian traffic. The combination of its economic function, exposure, and heavy usage justifies an upgrade in level of service. Specifically, primary and secondary designated retail streets warrant potential upgrades to Enhanced levels of service, while tertiary retail streets may not.

- *Increased durability for higher volume pedestrian traffic*
- *Pedestrian priority*
- *Support at grade retail*
- *District branding*
- *Economic development*

Culture / Entertainment

Streetscapes with cultural and entertainment facilities and functions are streetscapes which can define a city. Their exposure, heavy usage, economic function, cultural importance and branding value support a higher level of service. Special connections to cultural amenities via trails or mews would also upgrade the level of service.

- *Increased durability for higher volume pedestrian traffic*
- *Economic development*
- *Cultural and arts importance*
- *Special pedestrian connections and trails to cultural amenities*
- *District branding*

Higher Order Transit

Streetscapes along higher order transit areas must support increased pedestrian and vehicular traffic. Mobility hubs and regional connections are examples where an interaction between different modes of transportation along these streetscapes require a more robust design solution for increased pedestrian safety. Higher order transit, in the form of mobility or transit hubs, are nodes and have a wide affect that are not exclusive to any one streetscape. Therefore, the higher order transit criteria for mobility or transit hubs can apply to streets which are within the primary zone of the hub (approximately 250 m radius, or two minute walk).

- *Increased durability for higher volume pedestrian traffic*
- *Pedestrian priority*

- *Transportation importance*
- *Cultural Importance*

Heritage

Streetscapes with heritage importance, such as Heritage Conservation Districts, are special streets which require specific design requirements. To maintain its historical character, heritage streetscapes often need special materials or custom construction. Streetscapes within heritage areas may have an upgraded level of service to accommodate the special design requirements.

- *Cultural importance*
- *District branding*
- *Economic development*

Environmental

Some streetscapes have an associated environmental value. For example, streetscapes with low impact development measures have more enhanced planting and function more like a part of municipal infrastructure with regards to stormwater management. Double rows of trees and structural soil cells also indicate environmental streetscapes. The special functions of environmental streets warrant an upgrade in the level of service.

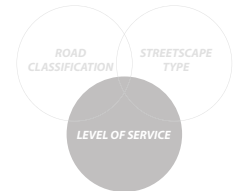
- *Special planting*
- *Low impact development measures*

Pedestrian Priority or Pedestrian Area

In a Pedestrian Priority Zone, pedestrians can move more comfortably as implied priority for vehicles is reduced. Pedestrian Priority Zones could be designed as a mews or a flexible space street. Detailed consideration must be given to ensure the design is accessible to all road users. Design features may include the reduced use of demarcation and signage, flush / level surfaces, elevated intersections, planting, pedestrian-scale lighting and furnishings. Pedestrian Priority Zones are designed for low vehicle speeds.

A Pedestrian Area is dedicated to pedestrians, and only authorized vehicles are permitted in the area (such as for servicing or emergency access). Transit services may also be permitted where necessary. A street may be permanently a Pedestrian Area, such as a pedestrian-only mews, or created as a temporary Pedestrian Area through road closures for special events or seasons.

- *Increased durability for higher volume pedestrian traffic*
- *Economic development*
- *Cultural and arts importance*
- *District branding*



Premium Level of Service Criteria

Premium streetscapes are characterized as significant and memorable. Premium streetscapes are often the single most important street in a district. Often the Main Street or a high end retail street is the street which qualifies for Premium level of service. For a streetscape to be classified for a Premium level of service, it must be a significant economic generator or be of significant civic / cultural importance.

Significant Economic Generator

Streetscapes that are designated or are significant economic generators justify a Premium level of service. The reason for this is the synergy and mutual benefit generated between Premium streetscapes and significant economic generating land uses. For example, Business Improvement Areas (BIAs) often recognize the importance and correlation of high quality streetscapes to their success and invest in the streetscape themselves. Premium level of service streetscapes should have significant economic generators which benefit from the high level service and potentially can be maintained by the land uses they serve. Significant economic generators are typically high end or intense primary retail.

The retail criteria for Enhanced level of service is similar to the a significant economic generator, however the difference is found in the degree of significance. An Enhanced street may have primary retail, however it may not have the regional significance of, for example, Yorkville in Toronto or Soho in New York City. Premium level of service streetscapes with significant economic generators are intended to have regional significance and name recognition for their quality and experience.

Examples of land uses that are significant economic generators include, but are not limited to:

- *High end primary retail*
- *Intensive primary retail*

Significant Civic / Cultural Importance

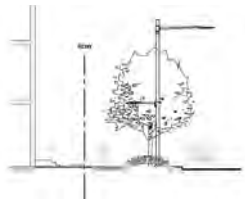
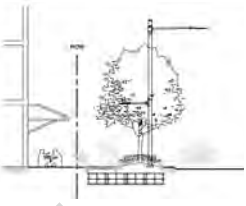
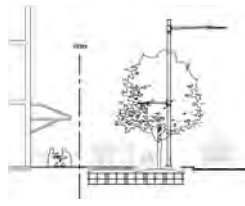
Streetscapes with significant civic and cultural importance can indirectly generate economic benefit for surrounding land uses. Major urban squares, art galleries, performing arts buildings, city halls and museums are places of civic pride and activity. Streetscapes which are associated with spaces with significant civic and cultural importance have a personal and emotional attachment for individuals. These are often streetscapes which are associated with spaces of major regional or civic events and major performances. These streetscapes therefore form an identity and brand and represent the district at a regional scale. These are spaces and streetscapes to be celebrated and therefore require a Premium level of service.

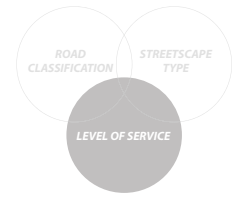
The criteria of significant civic / cultural importance is similar to the culture / entertainment criteria for an Enhanced level of service. The difference between the two criteria remains in the significance of the importance. For example, there is cultural importance for cultural facilities of all sizes. However, facilities such as Toronto's Art Gallery of Ontario or New York City's Guggenheim hold a larger regional significance.

Examples of land uses which create significant civic and cultural importance include, but are not limited to:

- *Major urban squares*
- *City hall*
- *Art galleries*
- *Performing arts building*
- *Major museums*

Level of Service Upgrade Criteria Chart

		LEVEL OF SERVICE		
		STANDARD URBAN	ENHANCED	PREMIUM
				
CRITERIA				
Retail				
	<i>Increased durability for higher volume pedestrian traffic</i>			
	<i>Pedestrian priority</i>			
	<i>Support at grade retail</i>		✓	
	<i>District branding</i>			
	<i>Economic development</i>			
Cultural / Entertainment				
	<i>Increased durability for higher volume pedestrian traffic</i>			
	<i>Economic development</i>			
	<i>Cultural and arts importance</i>		✓	
	<i>Special pedestrian connections and trails to cultural amenities</i>			
	<i>District branding</i>			
Higher Order Transit				
	<i>Increased durability for higher volume pedestrian traffic</i>			
	<i>Pedestrian priority</i>		✓	
	<i>Transportation importance</i>			
	<i>Cultural importance</i>			
Heritage				
	<i>Cultural importance</i>		✓	
	<i>District branding</i>			
	<i>Economic development</i>			
Environmental				
	<i>Special planting</i>		✓	
	<i>Low impact development measures</i>			
Pedestrian Priority or Pedestrian Area				
	<i>Increased durability for higher volume pedestrian traffic</i>			
	<i>Economic development</i>		✓	
	<i>Cultural and arts importance</i>			
	<i>District branding</i>			
Significant Economic Generator				
	<i>High end primary retail</i>			✓
	<i>Intensive primary retail</i>			
Significant Civic / Cultural Importance				
	<i>Major urban squares</i>			✓
	<i>City hall and civic importance</i>			
	<i>Art galleries</i>			
	<i>Performing arts building</i>			
	<i>Major museums</i>			



Streetscape Component Selection Matrix

Each level of service has associated streetscape components. The Streetscape Component Selection Matrix (see Appendix H) outlines which items are eligible in each level of service based upon the Streetscape Component Breakdown Chart (see Appendix I). The chart shows an increasing number of associated streetscape components from Standard Urban to Premium levels of service. The intent is that Premium streetscapes offer the greatest design versatility by offering the widest selection of components. Standard Urban streetscapes offer only the minimum standard and include the least variety of components. Therefore, higher levels of services may have access to lower level of service components while lower levels of service may not use higher level of service components.

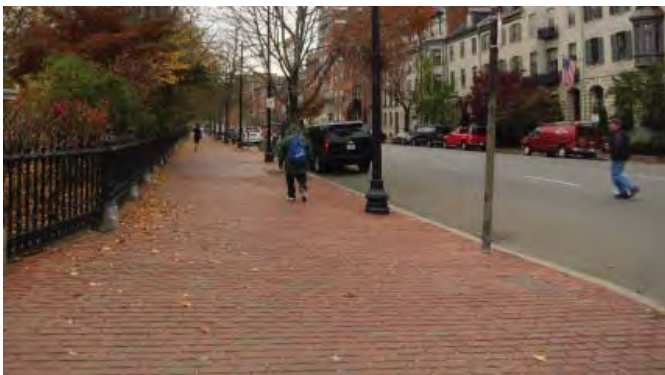
Streetscape Component Breakdown Chart

The relevance of the level of service concept is found in the deconstruction of the streetscape, the detail then added to the deconstructed components, and the subsequent construction of level of service prototypes from the detailed components. The Streetscape Component Breakdown Chart (see Appendix I) is a deconstruction of a streetscape into the structural zones discussed in Section 3 and the potential components each zone may have. Each component is assigned a unit measurement, typical capital unit cost, an inherent level of service, and a typical life expectancy. The unit measurement and capital unit cost have been derived from current construction standards and will change over time. It is recommended that a review and update of typical construction costs be done every five years.

The inherent level of service for each component is influenced by capital cost, operation and maintenance cost, quality and functional factors; it helps in establishing which components are eligible in each level of service in the Streetscape Component Selection Matrix.



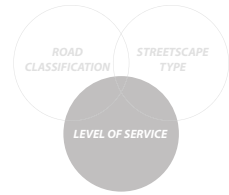
Low Selection of Streetscape Materials



Greater Selection of Streetscape Materials



Versatile Selection of Streetscape Materials



Operations and Maintenance

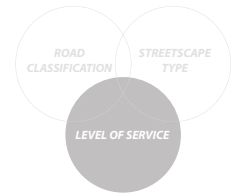
Beyond initial construction and capital costs, streetscapes also have annual operations and maintenance costs. Different streetscape components can imply different operations and maintenance activities. Given that these activities and costs are recurring cost commitments it becomes important for municipalities to understand the future financial implications of such activities. Therefore, the level of service concept includes operations and maintenance.

Each streetscape zone is divided into maintenance elements where components with similar maintenance activities are combined together. Maintenance activities have been assigned cost assumptions approved by Vaughan and associated responsible departments. The costs have been applied across a streetscape to determine the potential future financial commitments for operations and maintenance (see Appendix J for Operations and Maintenance Chart).



Street Maintenance New York, United States

Level of Service Prototypes



Typical streets have been created to demonstrate **design quality** and **cost differences** among the **levels of service**

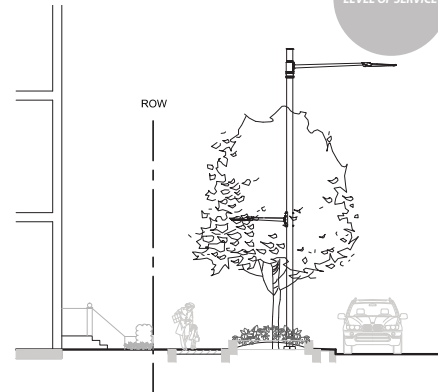
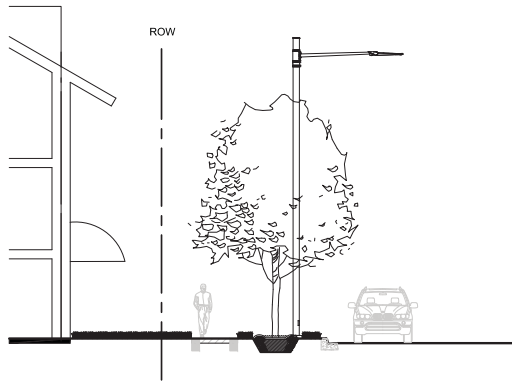
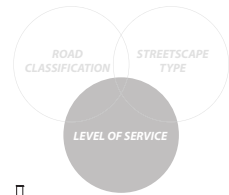
Based upon the level of service concept, several prototype or typical streets have been created to illustrate the progression of design quality and cost differences among the levels of service. The Basic level of service is shown as the existing standard of Vaughan derived from the typical major collector road found in the Vaughan Engineering Standards. The Standard, Enhanced and Premium prototypes represent the typical levels of service which would be applied to the identified Urban Intensification Areas and Heritage Conservation Districts within Vaughan. An example of a special designed street, the Enhanced Green level of service, is also shown to illustrate special cases.

Cross-Sections

The prototypes have been developed from typical streetscape cross-sections. Each cross-section is designed to represent the typical level of service character over 10 m. Cost estimates (per linear meter costs) have been derived to characterize the potential financial commitment to each level of service prototype.

Basic Costs

It is important to note that the capital and operations and maintenance costs of the Basic level of service reflect base standard suburban major collector streetscapes and not suburban residential streetscapes. This is important since suburban residential streetscapes have minimal municipal operations and maintenance activities and are primarily taken care of by residents such as snow shoveling and lawn mowing.



Basic Level of Service

Basic level of service is a representation of the existing suburban road in its most fundamental form. It provides the minimum functionality of a streetscape for a street with low pedestrian volume and activity. The streetscape is predominantly softscape in Basic levels of service and is characteristic of the suburban context with a narrow sidewalk (1.5 m) and sodded boulevard. Given that the Vaughan City-Wide Streetscape Implementation Manual is intended for Urban Intensification Areas and Heritage Conservation Districts, the basic level of service will not typically apply.

Typical characteristics:

- Low intensity pedestrian traffic
- Standard sidewalk width (1.5 m)
- Standard concrete
- Sod and street trees
- Standard street lighting

Typical Costs Single Sided

Capital Cost:	\$515 / linear meter
Operations and Maintenance:	\$5 / linear meter / yr (2013 Canadian dollars)
Typical Boulevard Width:	5.5 - 6.0 m



Standard Urban Level of Service

Standard Urban level of service is a basic streetscape for an urban context. Standard Urban level of service provides predominantly hardscape options for areas that would typically be softscape in Basic level of service, where applicable. Given the urban context, Standard Urban streetscapes anticipate higher pedestrian traffic due to greater population density of urban areas. The Standard Urban streetscape replaces the Basic streetscape and the existing Vaughan Engineering Standard for those within a more urban settings.

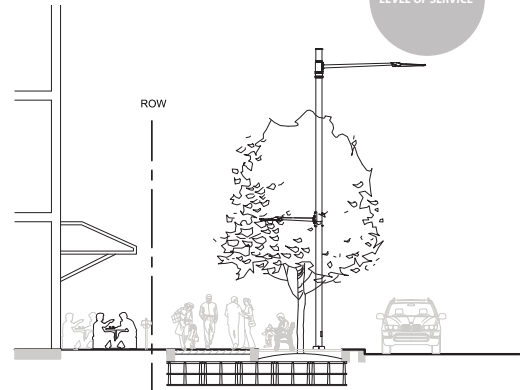
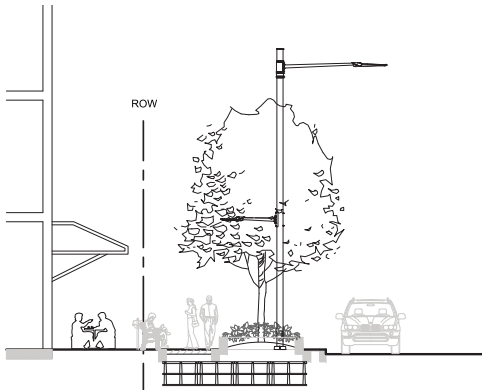
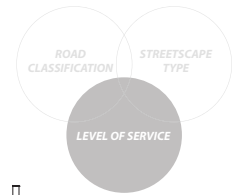
Typical characteristics:

- Street related uses, urban intensity, and higher pedestrian traffic
- Larger pedestrian clearway width (2.0 m) to accommodate more pedestrian activity
- Standard concrete
- Street trees in urban pits

Typical Costs Single Sided

Capital Cost:	\$975 / linear meter
Operations and Maintenance:	\$100 / linear meter / yr (2013 Canadian dollars)
Typical Boulevard Width:	5.5 - 6.0 m





Enhanced Level of Service

The Enhanced level of service meets the needs in areas with greater pedestrian traffic associated with urban retail, commerce, transit, entertainment and civic uses. Enhanced level of service permits a wide range and quality of materials which also is associated with a higher costs. Enhanced Streets offer a variety of pedestrian amenities such as street furniture, enhanced paving, ornamental planting, pedestrian and accent lighting, and low impact development measures.

Typical characteristics:

- Street related uses, urban intensity, and higher pedestrian traffic
- Materials reflect quality of place
- Greater use of unit paving and accent designs
- Larger clearway width for more pedestrian activity
- Street furniture, Enhanced tree planting and pedestrian lighting to create a safer, more pedestrian-friendly environment
- LID and sustainability features

Typical Costs Single Sided

Capital Cost: \$2,920 / linear meter
 Operations and Maintenance: \$150 / linear meter / yr (2013 Canadian dollars)
 Typical Boulevard Width: 5.5 - 6.0 m



Premium Level of Service

Premium level of service is the highest level of streetscape quality. For areas of high pedestrian visibility, cultural significance and special cases, the Premium level of service uses the highest quality materials, offers the most pedestrian amenity and the highest level of design. Premium level of service streets are memorable pedestrian experiences, often the main street of an Urban Intensification Area or Heritage Conservation District and can often become destinations and iconic streets.

Typical characteristics:

- High urban intensity, special streets
- High quality materials to attract and accommodate higher levels of investment and pedestrian traffic
- Large pedestrian zones with amenities (shrub and perennial planters, street furniture, etc.) to create a memorable experience
- Accent lighting to highlight interesting elements
- Tree infrastructure to help trees survive in urban environment
- Special features and public art

Typical Costs Single Sided

Capital Cost: \$3,390 / linear meter
 Operations and Maintenance: \$170 / linear meter / yr (2013 Canadian dollars)
 Typical Boulevard Width: 6.0 - 7.0 m



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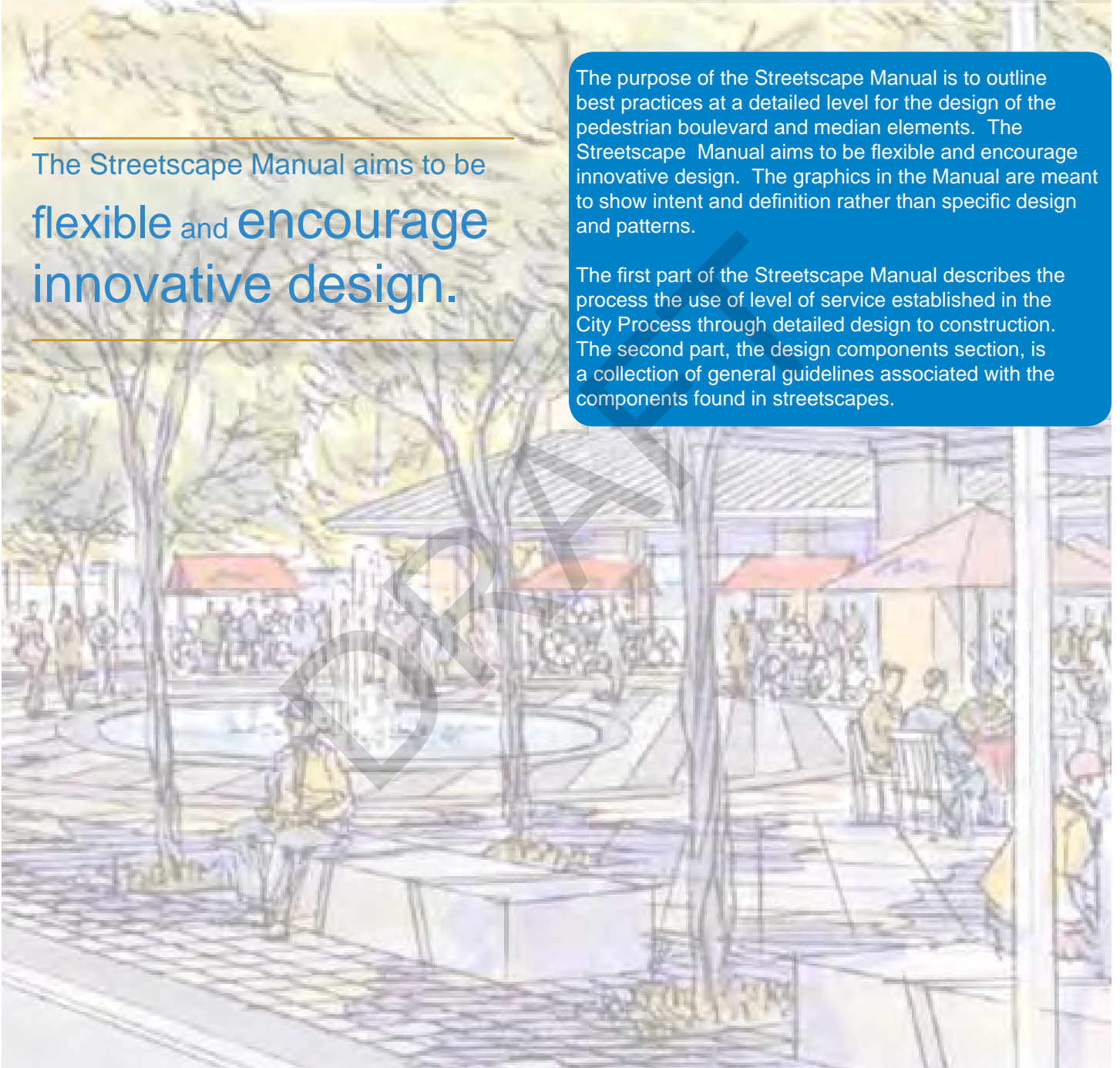
STREETSCAPE MANUAL



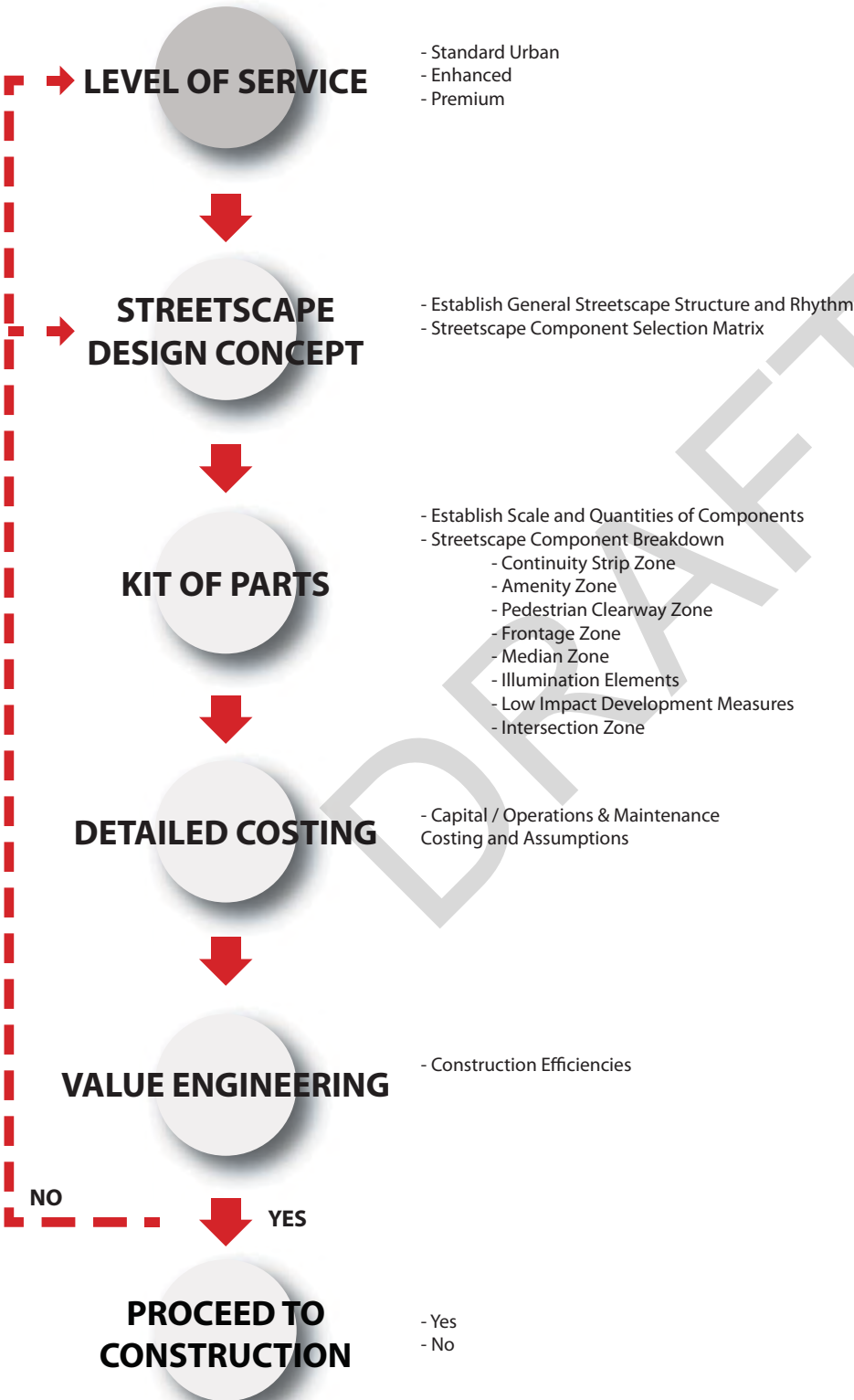
The Streetscape Manual aims to be flexible and encourage innovative design.

The purpose of the Streetscape Manual is to outline best practices at a detailed level for the design of the pedestrian boulevard and median elements. The Streetscape Manual aims to be flexible and encourage innovative design. The graphics in the Manual are meant to show intent and definition rather than specific design and patterns.

The first part of the Streetscape Manual describes the process the use of level of service established in the City Process through detailed design to construction. The second part, the design components section, is a collection of general guidelines associated with the components found in streetscapes.



Using Level of Service for Design



City or Developer Process

The City Process yields the level of service for each block along a streetscape, as well as a prototype design and estimated cost. The purpose of the City or Developer Process is to take the determined levels of service and develop a detailed design.

Using the associated streetscape components allowed from the Streetscape Selection Matrix (see Appendix H) and the guidelines from the design components section, a more detailed design can be crafted.

A Streetscape Component Breakdown (see Appendix I) can then be used for a detailed costing of the design.

Level of Service

Determination of the level of service is typically done in the City Process, described in Section 4.

Streetscape Design Concept

Once the level of service for each block and side of the street is determined, the designer can use the Streetscape Component Selection Matrix (see Appendix H) to determine which components are available per the level of service of the streetscape they are designing. The Streetscape Component Selection Matrix contains the components categorized into the streetscape structure and determines which components are permitted. At this stage rhythm of trees and general structure and sizes of zones are determined to create a streetscape framework. The design framework is based upon the context criteria found in the City Process to respond to the roadway and adjacent land use functions.

Kit-of-Parts

During the Kit-of-Parts stage, sizes, scale and quantities of the streetscape components are established. These are placed in the streetscape design and used for the detailed costing. The Enhanced and Premium Defaults, found at the end of Section 5, are the default material components for enhanced and premium levels of service for projects which do not have master plan designs. The established defaults are to ensure that streetscapes in Vaughan meet a minimum standard of cohesion.

Detailed Costing

At this point, designers have a detailed design of a streetscape and use the Streetscape Component Breakdown Chart (see Appendix I) to determine cost. The chart includes typical costs of potential streetscape components and their locations in the streetscape structure. The use of the Streetscape Breakdown Chart allows for all projects designed in the level of service concept to be compared on a similar level with the coinciding methodology. An Operations and Maintenance Assumptions Chart (see Appendix J) allows for the potential operations and maintenance costs to also be determined for a better understanding of the future financial impact to the City.

Value Engineering

The value engineering stage is an important part of the process to ensure that the design is as efficient as possible. Potential construction efficiencies should be explored and the cost of the project should be compared to the budget.

Proceed to Construction

After the project is value engineered, it is a Council decision as to whether to proceed with construction. If the project is approved, construction may proceed. However, if it is not approved due to cost or design, the project may return to the level of service phase to re-evaluate the level of service chosen and rework the design.

Design Components

The general purpose of the design components section of the Manual is to communicate the following for each streetscape component:

- Function
- Design Intent
- Quality

Using the levels of service indicated in the master plan, designers can formulate a design using select components which meet the needs of the level of service.

Design Components

The streetscape design components are categorized into:

- Paving
- Planting
- Illumination Elements
- Site Furnishings
- Medians
- Intersections
- Public / Private Frontage
- Utilities
- Innovation

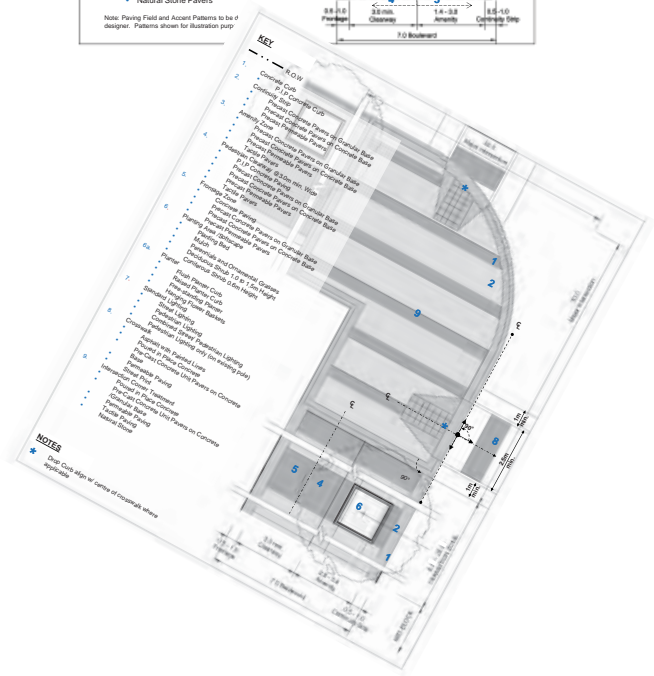
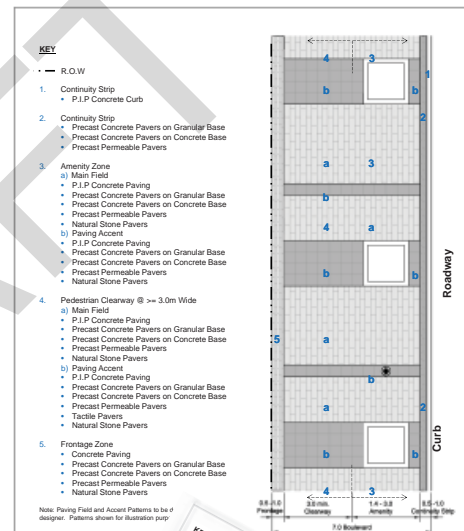
General guidelines have been developed to guide the selection of materials and amenities. For design versatility, each component is explained in relation to design intent with graphic diagrams for each level of service, including information such as:

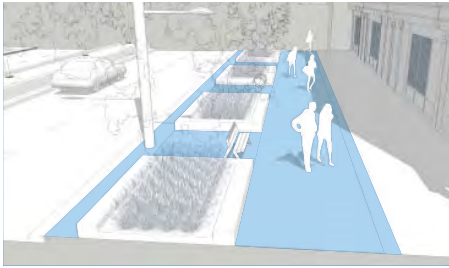
- Streetscape zones affected
- Potential materials
- Potential configuration in relation to other elements
- Typical ranges of component measurements

Innovation components are addressed differently than other typical streetscape components. These include low impact development measures and public art, which are site and context specific.

Kit-of-Parts

The Kit-of-Parts graphically shows the intended components allowed in each level of service as a potential palette of materials. In addition to the comparison of components between levels of service, standard default components have been selected for Enhanced and Premium levels of service. Where there is no master plan design prepared for a project, the Kit-of-Parts establishes a default type and pattern for the paving. Approved master plan designs may override the default.





Paving



Planting



Illumination Elements



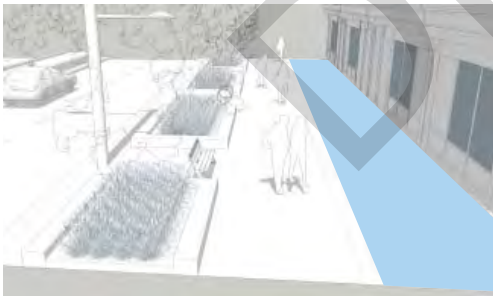
Site Furnishings



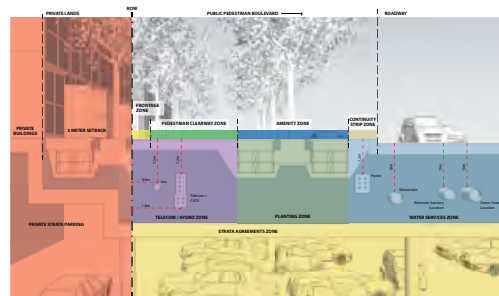
Medians



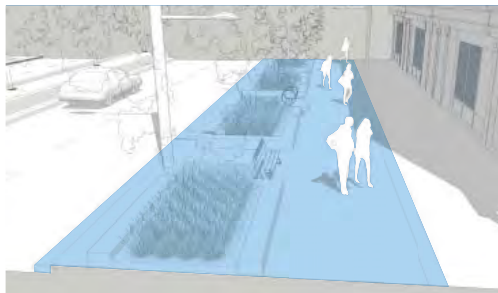
Intersections



Public / Private Frontage



Utilities



Innovation

Paving

Paving supports pedestrian traffic, cycling and accessibility; it is always located in the pedestrian clearway zone. In urban environments, paving is also commonly located in the frontage zone, amenity zone and continuity strip zone.

Paving provides a definition of space, visual aesthetic and represents the character of the area. For example, definition of space for different modes of transportation can be achieved through the use of field and accent paving. Alternatively, using a single field of paving across a roadway and pedestrian boulevard creates the perception of a single space from building face to building face.

Function

- Supports pedestrian traffic
- Supports cycle traffic
- Supports accessibility
- Definition of space
- Visual aesthetic
- Character, identity and branding of an area

Unit Paving

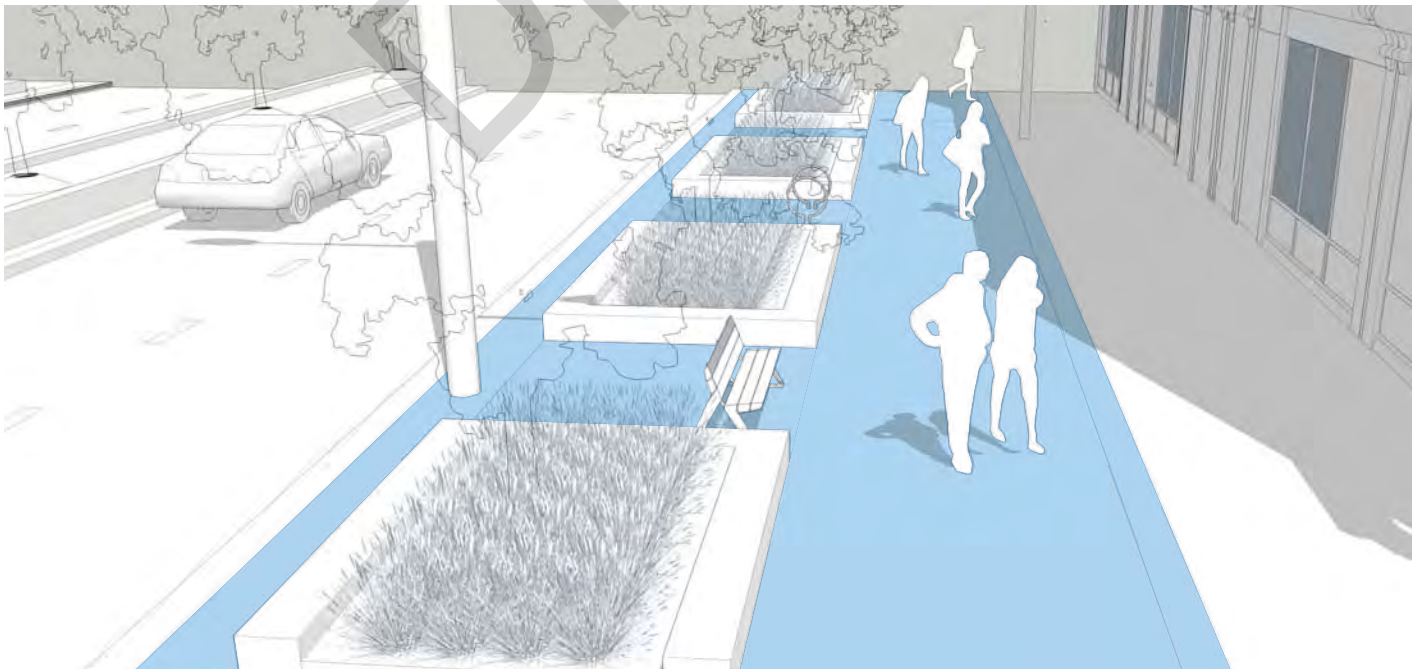
- Where applicable, unit paving should be constructed on a concrete base for durability and to avoid differential settlement.

Pedestrian Clearway

- The pedestrian clearway zone should be paving and a minimum of 2 m in Standard Urban and Enhanced levels of service.
- Premium levels of service should have a paved pedestrian clearway of a minimum of 3 m to accommodate increased pedestrian traffic flows.
- The pedestrian clearway paving should be free of obstacles.

Raised Cycle Track / Multi-use Pathways

- Typical paving shall be asphalt.
- Where raised cycle tracks and multi-use pathways are located along Enhanced or Premium streetscapes, cycling facilities may be paved using coloured concrete or unit paving complimentary to adjacent pedestrian boulevard unit paving.
- Where applicable, multi-use pathways shall be differentiated from the pedestrian boulevard with accent paving.
- Cycling facilities must meet Ontario Traffic Manual Book 18 guidelines.

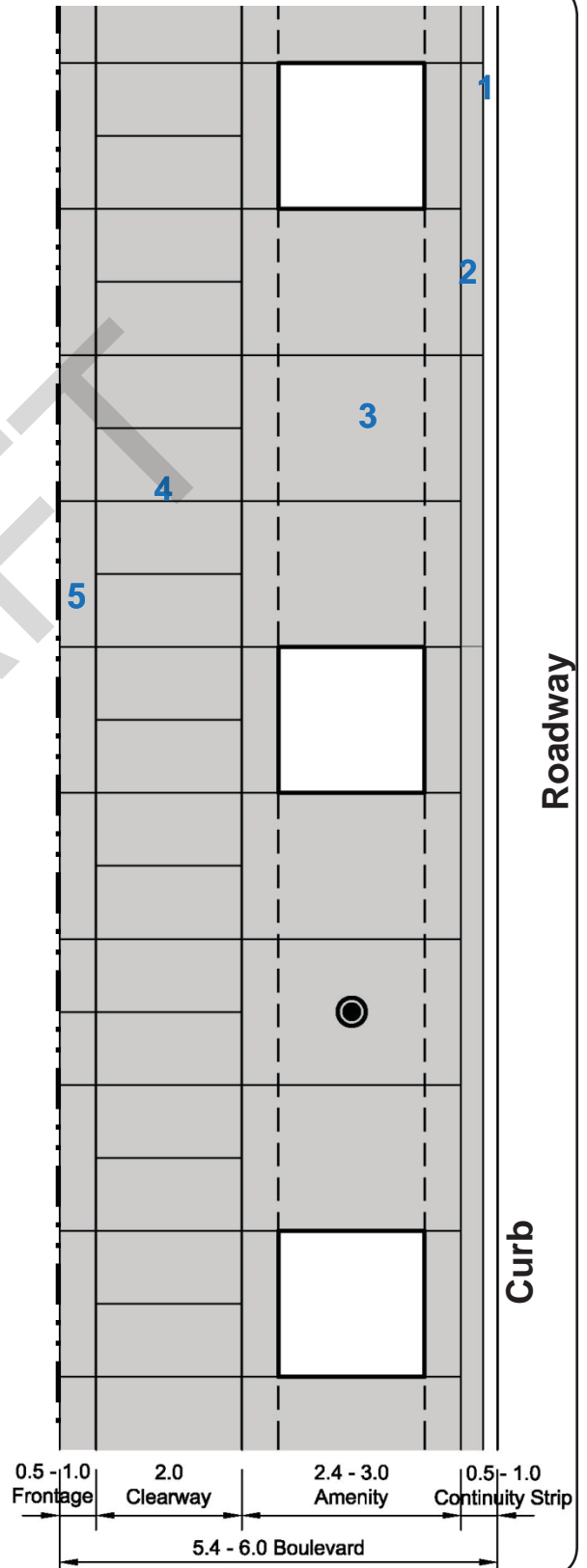


Standard Urban

KEY

- — R.O.W
- 1. Concrete Curb
 - P.I.P Concrete Curb
- 2. Continuity Strip
 - P.I.P Concrete
- 3. Amenity Zone
 - P.I.P Concrete Paving
- 4. Pedestrian Clearway 2.0m
 - P.I.P Concrete Paving
- 5. Frontage Zone
 - P.I.P Concrete Paving

DRAFT

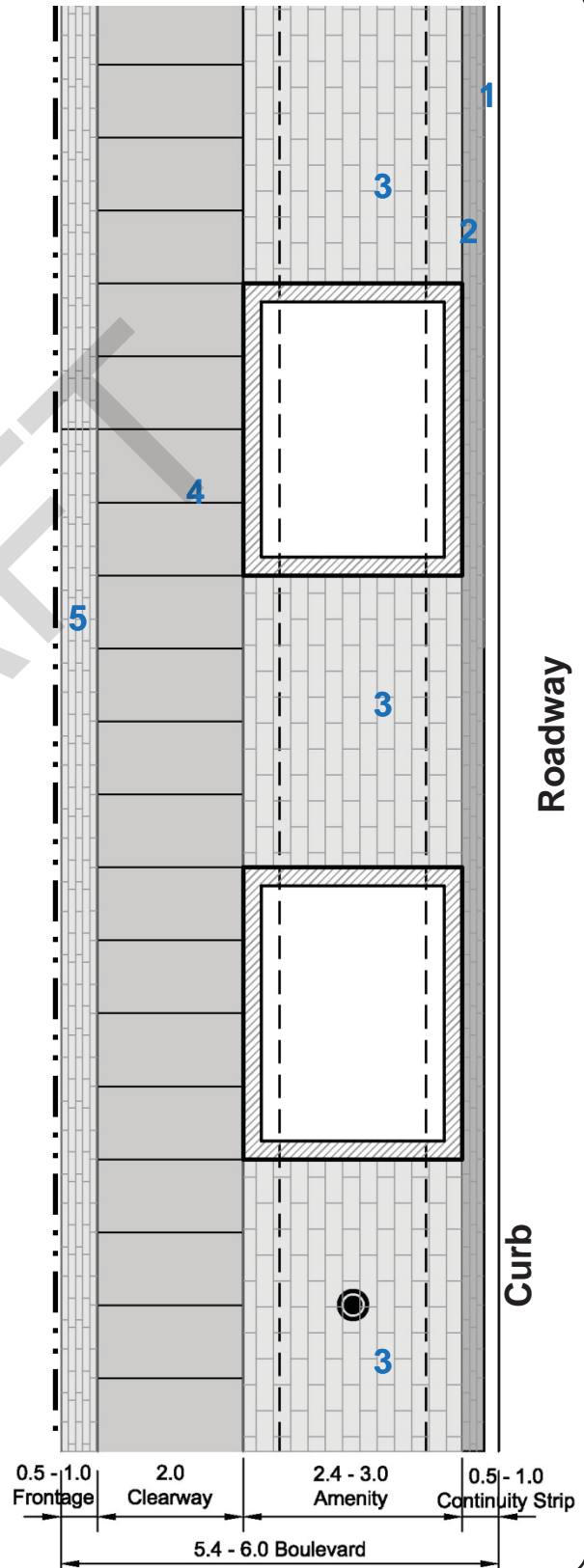


Note: Paving Field and Accent Patterns to be determined by designer. Patterns shown for illustration purposes only.

Enhanced

KEY

- — R.O.W
- 1. Continuity Strip
 - P.I.P Concrete Curb
- 2. Continuity Strip
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
- 3. Amenity Zone
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
 - Tactile Pavers
- 4. Pedestrian Clearway 2.0m
 - P.I.P Concrete Paving
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
 - Tactile Pavers
- 5. Frontage Zone
 - Concrete Paving
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers



Note: Paving Field and Accent Patterns to be determined by designer. Patterns shown for illustration purposes only.

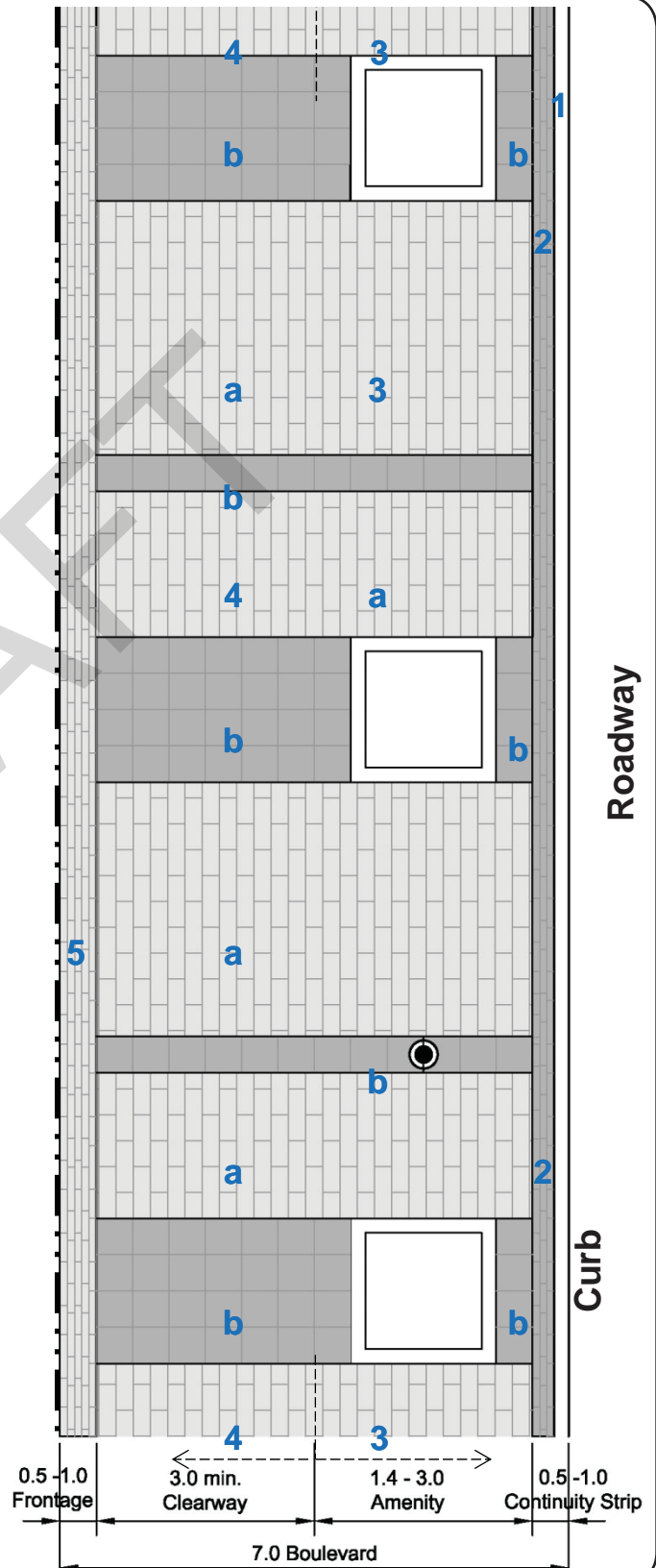
Premium

KEY

• — R.O.W

1. Continuity Strip
 - P.I.P Concrete Curb
2. Continuity Strip
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
3. Amenity Zone
 - a) Main Field
 - P.I.P Concrete Paving
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
 - Natural Stone Pavers
 - b) Paving Accent
 - P.I.P Concrete Paving
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
 - Natural Stone Pavers
4. Pedestrian Clearway @ $\geq 3.0\text{m}$ Wide
 - a) Main Field
 - P.I.P Concrete Paving
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
 - Natural Stone Pavers
 - b) Paving Accent
 - P.I.P Concrete Paving
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
 - Tactile Pavers
 - Natural Stone Pavers
5. Frontage Zone
 - Concrete Paving
 - Precast Concrete Pavers on Granular Base
 - Precast Concrete Pavers on Concrete Base
 - Precast Permeable Pavers
 - Natural Stone Pavers

Note: Paving Field and Accent Patterns to be determined by designer. Patterns shown for illustration purposes only.



Planting

Planting, otherwise known as softscape, provides both amenity and functionality. Planting in the form of trees, shrubs, perennials, ornamental grasses and ground cover provide visual aesthetics, protection from the elements, buffer zones, and oxygen. Planting is most often found in the amenity zone and occasionally the frontage zone.

Function

- Protection from the elements (sun, wind, rain, snow)
- Protection from urban elements (noise, car exhaust)
- Create definition of space / semi-private barriers (vegetation between public and residential lands)
- Absorb water, soil and air contaminants
- Stormwater management and low impact development measures
- Visual aesthetic
- Character, identity and branding of an area

Biodiversity

- Planting species should be selected based upon best practices for specific site characteristics.
- Planting should reflect a diverse urban forest with no more than 10% of any species, no more than 20% of a single genus and no more than 30% of a single family in a planting area.

Special Planting

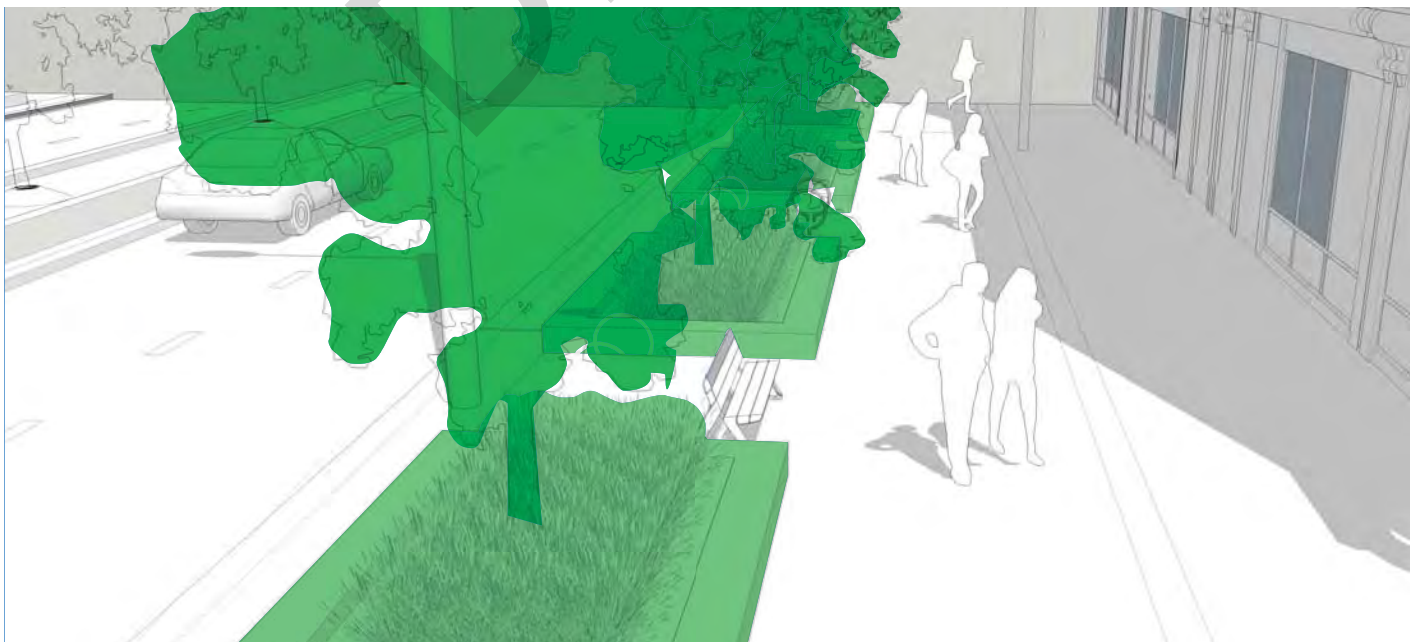
- Special planting could be used to distinguish special

areas of cultural and historical significance including gateways, nodes and plazas.

- Special consideration should be given to planting used for low impact development measures along the streetscape.
- Annual or seasonal planting displays may be mobile in nature (i.e., movable planters) and able to relocate to best accommodate winter snow removal operations while ensuring the streetscape aesthetic and design intent are not compromised.

General Street Planting

- Along transit intensification corridors and areas of high traffic volumes, locate planting in the amenity zone as a buffer between the vehicular traffic and pedestrian clearway zone.
- Locate curb and seat height planters in areas of fewer pedestrians for plant and tree protection from salt.
- Topsoil layer shall have an organic matter content of 10 - 15% by dry weight, pH of 6.0 - 8.0 and minimum depth of 60 cm in pits, trenches and planting beds.
- Subsoil shall have a minimum of 90 cm of total uncompacted soil depth.
- Drainage shall be provided for each planter.
- Planting species should be selected appropriately to site conditions and have low maintenance requirements.



Street Trees

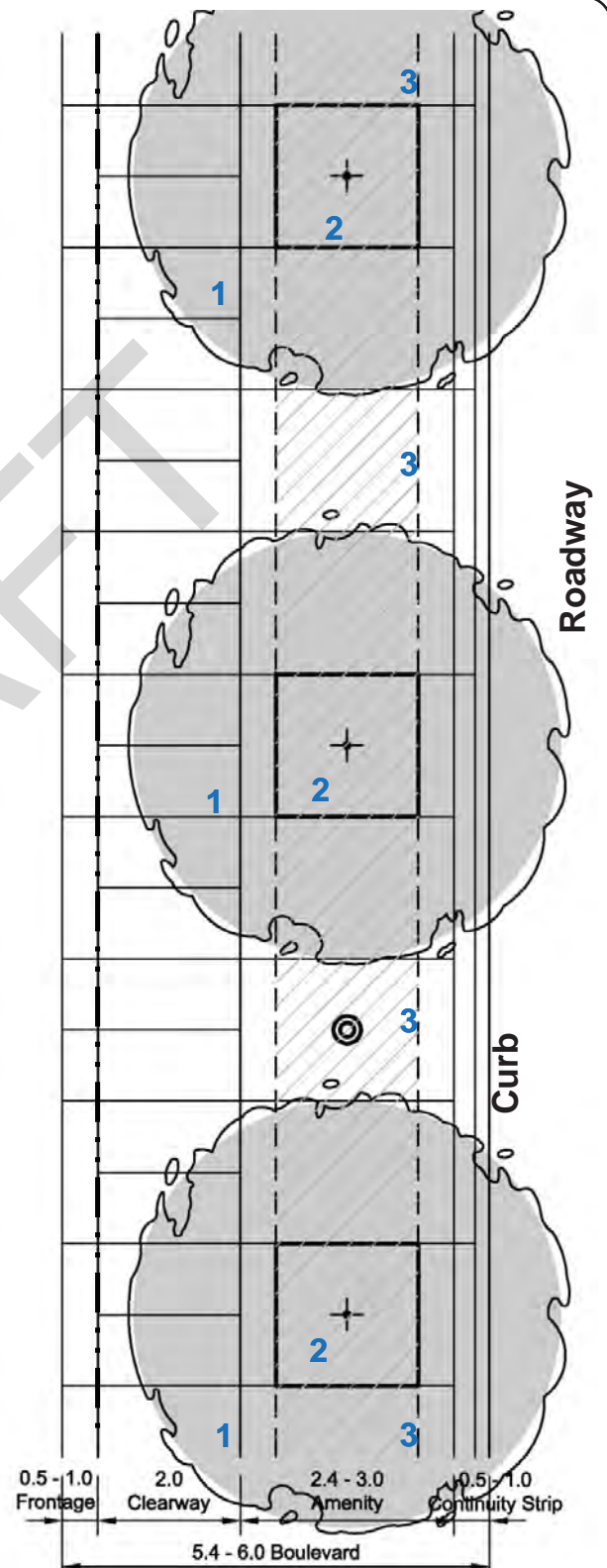
- Street trees should be planted approximately 6 - 8 m on centre to ensure adequate continuous tree pit soil volumes and a continuous protection from the elements for pedestrians depending on expected canopy maturity.
- Street trees should be planted a minimum of 2 m from the curb line (ideally 2.5 - 3.0 m) to the centre of the tree trunk.
- Allow for sufficient tree canopy allowance to ensure unencumbered canopy growth from buildings and other sidewalk elements.
- Street trees should have minimum 16 m³ of individual soil volume per tree. It is recommended that an additional 14 m³ of shared soil volume per tree be added for total shared soil volume of 30 m³.
- Tree grates shall be used in areas of high pedestrian traffic and volumes such as nodes, intersections and other urban areas.
- Introduce structural soil cells in areas of high pedestrian traffic to protect tree roots soil volumes.
- No public utilities should be located under street trees to avoid root conflicts.
- Street tree rhythm may vary between mid-block conditions and the transition zone of intersections.
- Where double rows of trees are contemplated, tree planters must be a minimum of 2 meters in width.
- Lists of approved street tree species for streetscapes are available for Vaughan and York Region. Designers should consult the lists to select appropriate street trees (see Appendix B,C and D).



Standard Urban

KEY

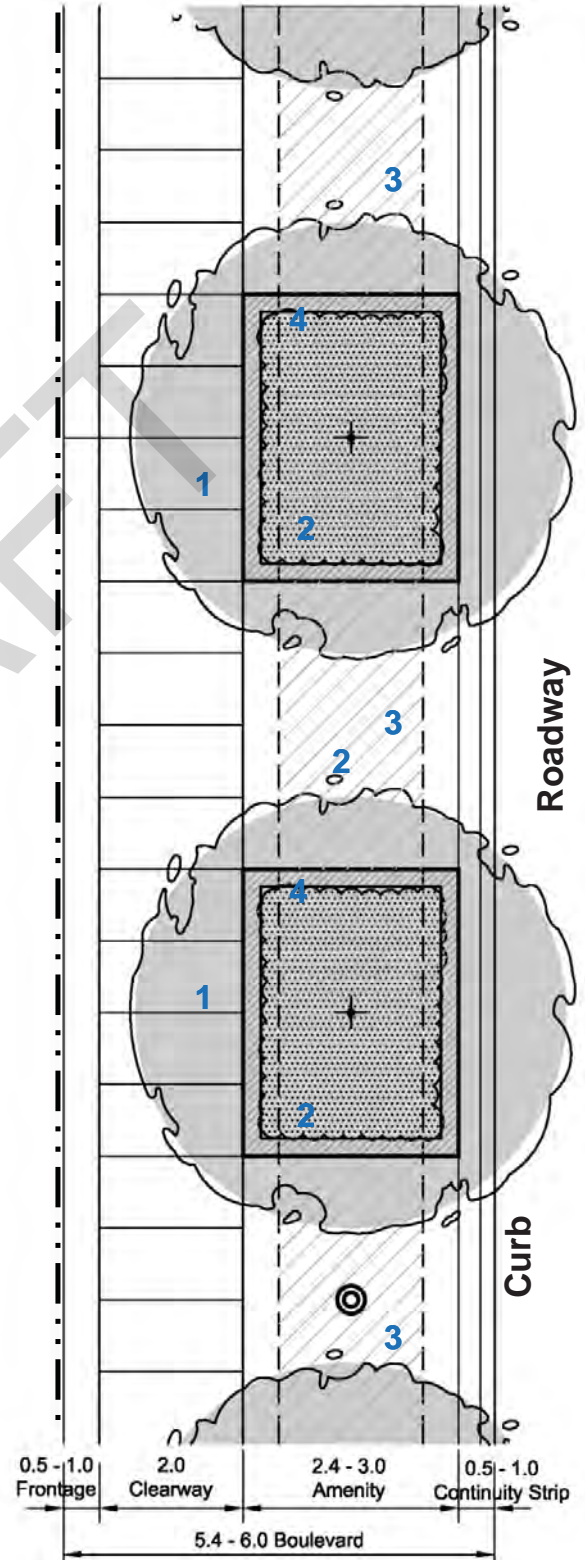
- — R.O.W
- 1. Tree Planting
 - 60mm Caliper for Deciduous
- 2. Planting Area /Softscape
 - Planting Soil
 - Tree Grate
 - Mulch
 - Perennials and Ornamental Grasses
 - Deciduous Shrub 0.6m Height
 - Coniferous Shrub 0.6m Height
- 3. Continuous Planting Trench Below



Enhanced

KEY

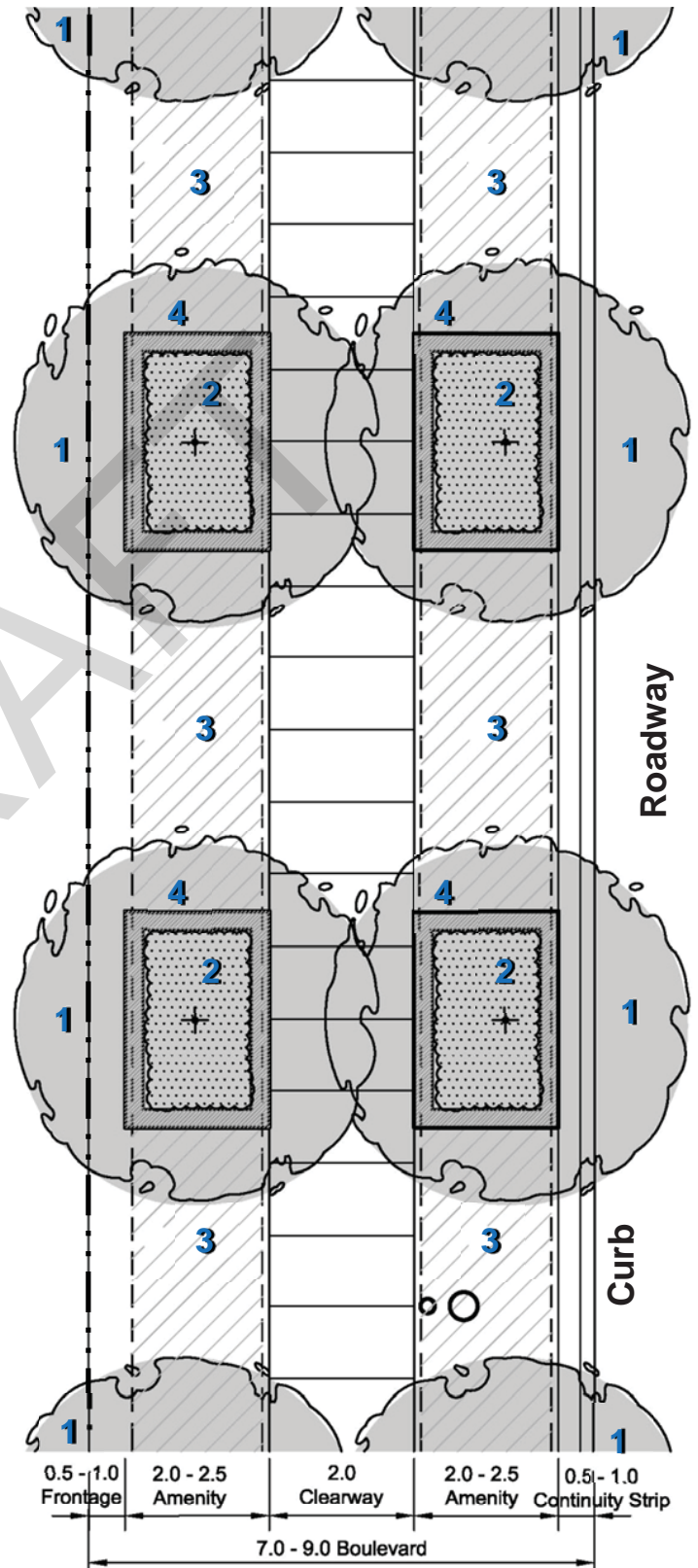
- R.O.W
- 1. Tree Planting
 - 80mm Caliper for Deciduous
- 2. Planting Area /Softscape
 - Planting Bed
 - Mulch
 - Perennials and Ornamental Grasses
 - Deciduous Shrub 1.0 to 1.5m Height
 - Coniferous Shrub 0.6m Height
- 3. Continuous Planting Trench Below
- 4. Planter
 - Flush Planter Curb
 - Raised Planter Curb
 - Free-standing Planter
 - Hanging Flower Baskets



Enhanced Double Row of Trees (Green Streets)

KEY

- — R.O.W
- 1. Tree Planting
 - 80mm Caliper for Deciduous
- 2. Planting Area /Softscape
 - Planting Bed
 - Mulch
 - Perennials and Ornamental Grasses
 - Deciduous Shrub 1.0 to 1.5m Height
 - Coniferous Shrub 0.6m Height
- 3. Continuous Planting Trench Below
- 4. Planter
 - Flush Planter Curb
 - Raised Planter Curb
 - Free-standing Planter
 - Hanging Flower Baskets

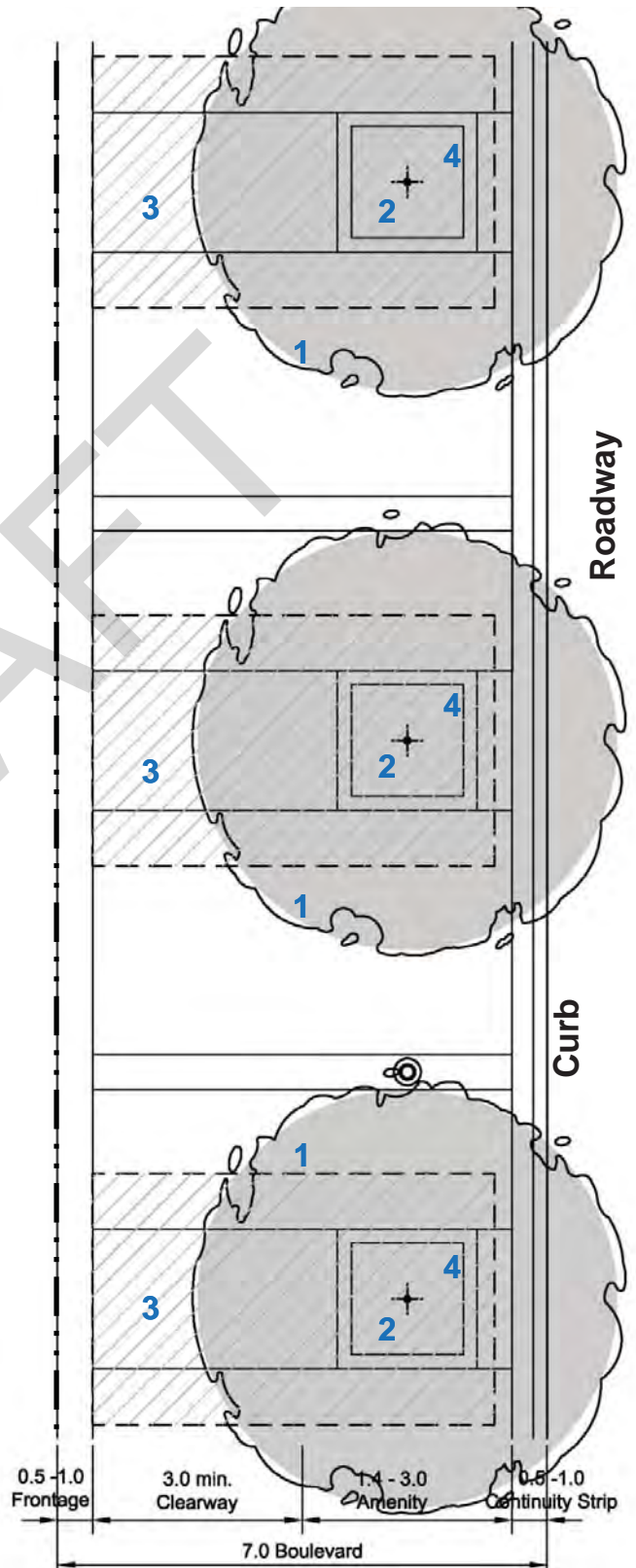


Note: Enhanced level of service streetscapes with a double row of trees in the public right-of-way requires a minimum of 2.0 meter wide planters and 2.0 meter pedestrian clearway. Where a double row of trees does not fit in the public row, consider negotiations with private land owners to plant a row of trees in the private setback.

Premium

KEY

- — R.O.W
- 1. Tree Planting
 - 100mm Caliper for Deciduous
- 2. Planting Area /Softscape
 - Planting Soil
 - Tree Grate
 - Mulch
 - Perennials and Ornamental Grasses
 - Deciduous Shrub 1.0 to 1.5m Height
 - Coniferous Shrub 0.6m Height
- 3. Structural Soil Cells (16 m³ min. vol. per tree, 30m³ for shared)
- 4. Planter
 - Flush Planter Curb
 - Raised Planter Curb
 - Seatwall Planter (@0.45m ht.)
 - Free Standing Planter
 - Hanging Flower Basketds
- 5. Continuous Planting trench Below

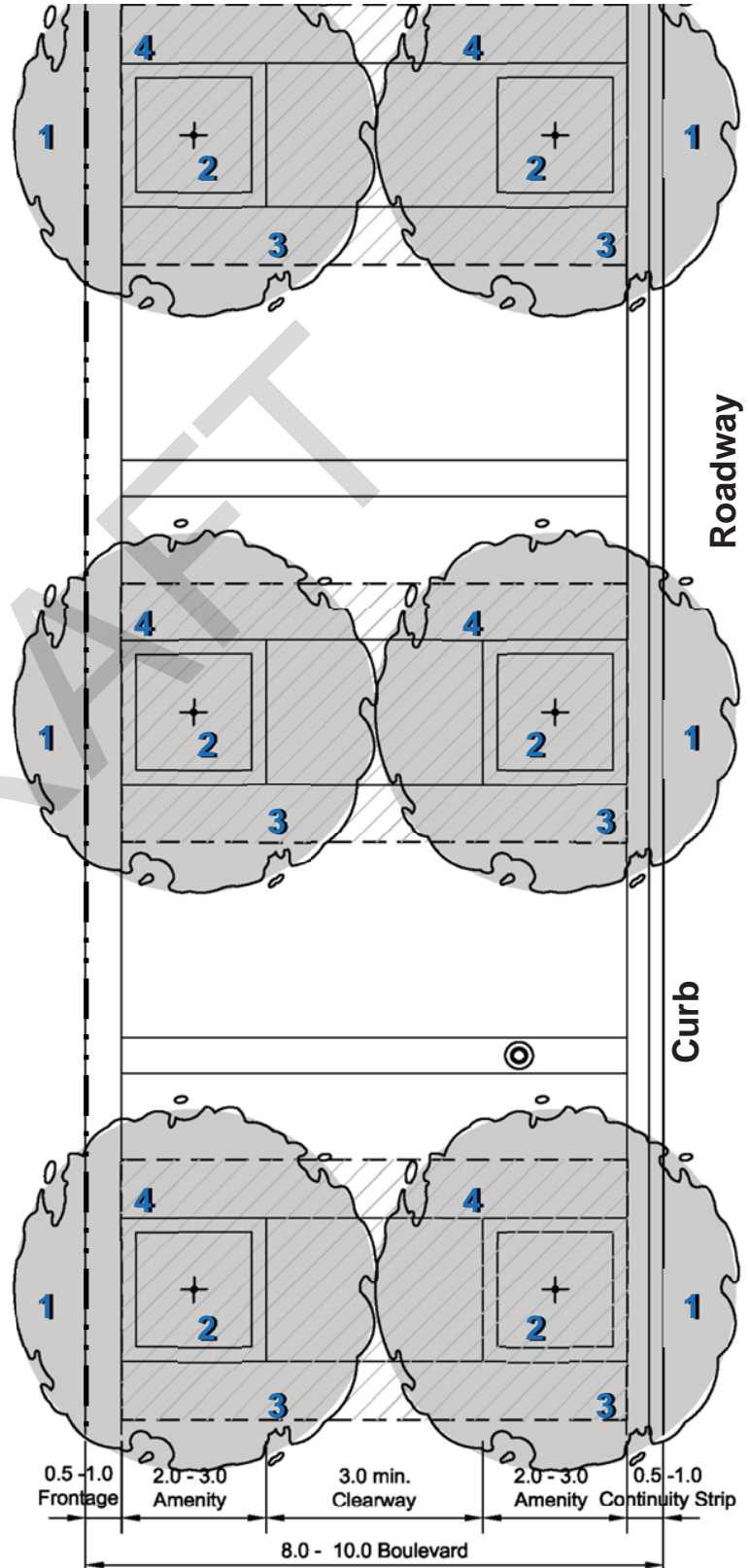


Premium Double Row of Trees (Green Streets)

KEY

— R.O.W

1. Tree Planting
 - 100mm Caliper for Deciduous
2. Planting Area /Softscape
 - Planting Soil
 - Tree Grate
 - Mulch
 - Perennials and Ornamental Grasses
 - Deciduous Shrub 1.0 to 1.5m Height
 - Coniferous Shrub 0.6m Height
3. Structural Soil Cells (16 m³ min. vol. per tree, 30m³ for shared)
4. Planter
 - Flush Planter Curb
 - Raised Planter Curb
 - Seatwall Planter (@0.45m ht.)
 - Free Standing Planter
 - Hanging Flower Basketds
5. Continuous Planting trench Below



Note: Premium level of service streetscapes with a double row of trees in the public right-of-way requires a minimum of 2.0 meter wide planters and 3.0 meter pedestrian clearway. Where a double row of trees does not fit in the public row, consider negotiations with private land owners to plant a row of trees in the private setback.

Illumination Elements

Illumination elements include street lighting, pedestrian lighting and accent lighting. While street lighting provides basic lighting requirements for vehicles, pedestrian lighting adds additional comfort and safety for streetscapes with pedestrian traffic during the night. Accent lighting is beneficial for streetscapes which have heavy pedestrian activity during the night including restaurant, retail and entertainment districts. Lighting influences the overall experience of spaces and contributes to establishing the character, identity and branding.

Function

- Vehicular safety
- Pedestrian scale comfort and safety
- Support night time activities
- Visual aesthetic
- Character, identity and branding of an area

General

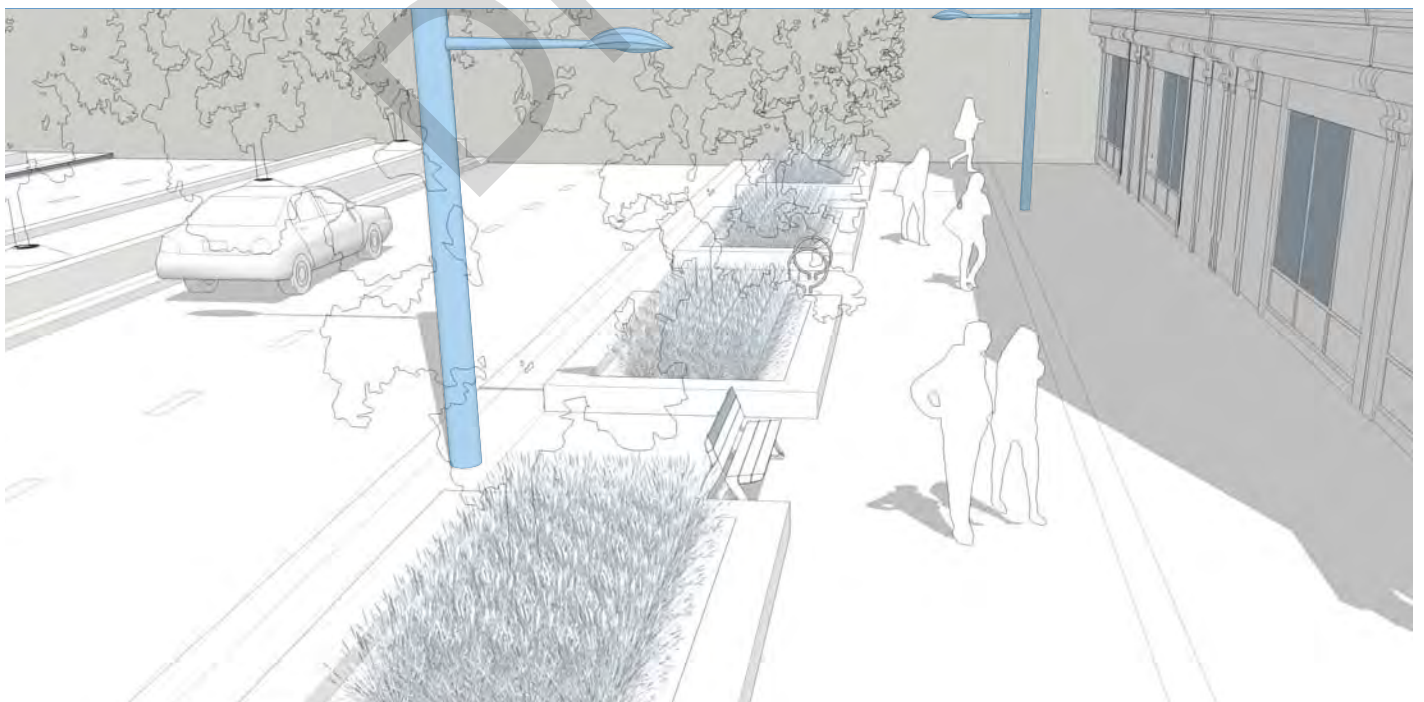
- Where possible, reduce light pole heights to create more human scaled streetscapes.
- Lighting design should follow dark sky principles.
- Street lighting should meet the City's Engineering Design Criteria and Standard Drawings. Designers must consult an electrical engineering consultant to ensure adequate lighting levels and coverage.

Street Lighting

- Street light locations should be located on a per project basis with an electrical engineering consultant.
- Street light poles should be approximately 6 – 7 m in height.

Pedestrian Lighting

- Pedestrian light locations should be located on a per project basis in consultation with an electrical engineer.
- Pedestrian light poles should be approximately 4 – 5 m in height for better human scale.
- Pedestrian lighting should be located on streets with night time pedestrian activity including public spaces, restaurants, retail and entertainment.

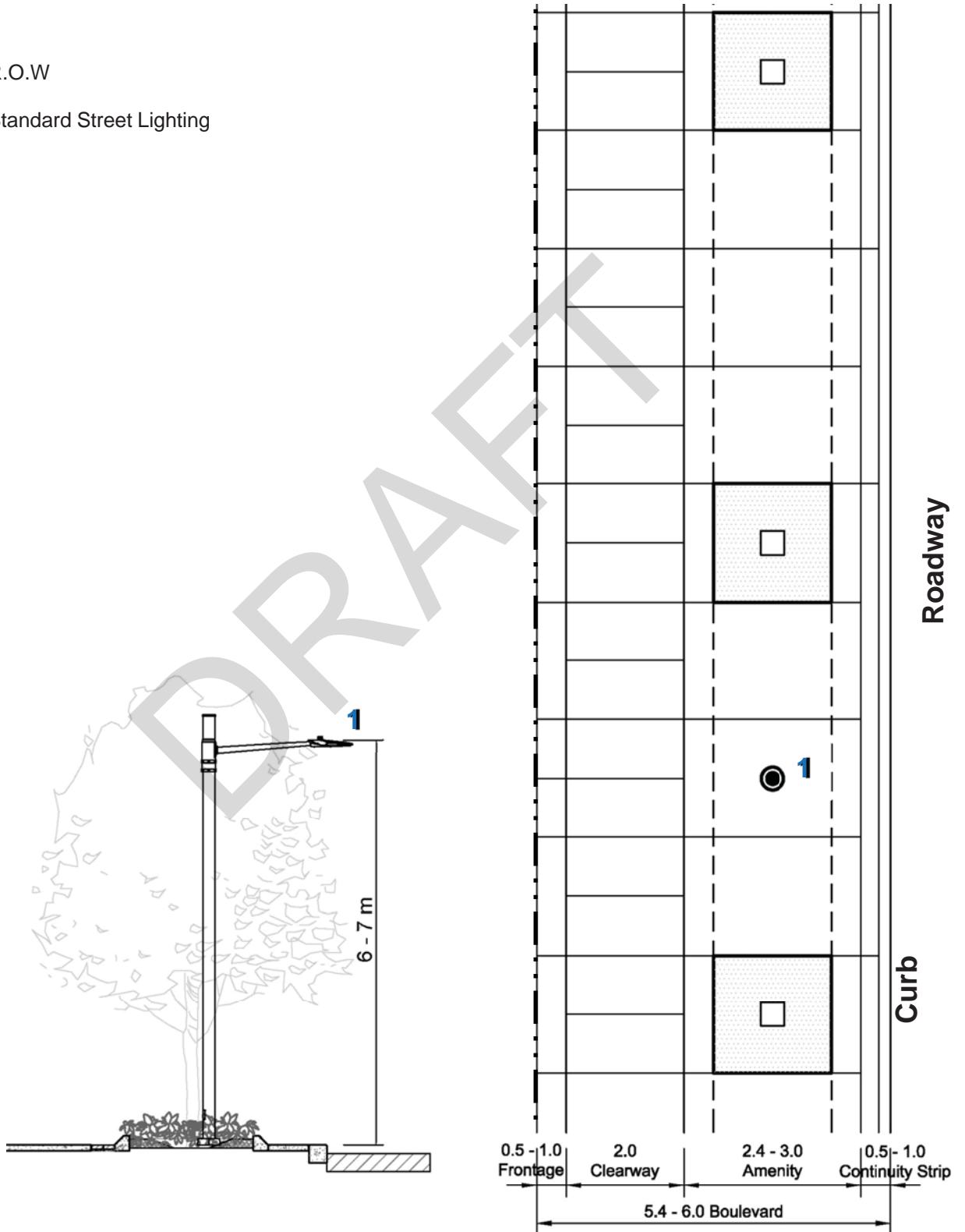


Standard Urban

KEY

— R.O.W

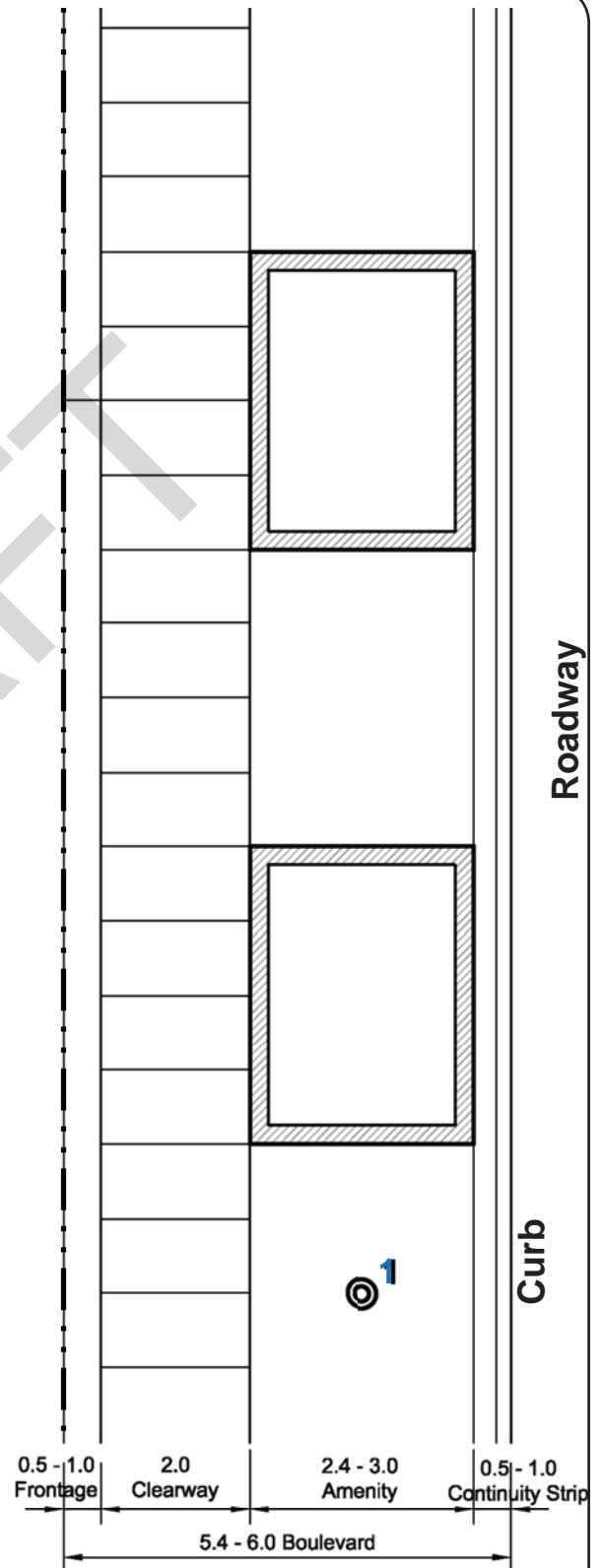
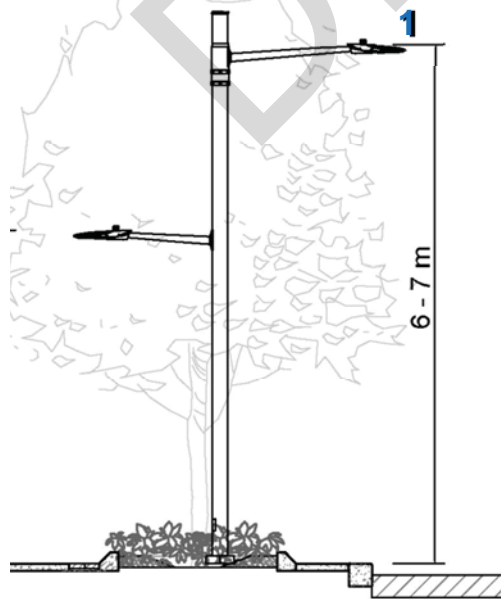
1. Standard Street Lighting



Enhanced

KEY

- R.O.W
- 1. Standard Lighting
 - Street Lighting
 - Pedestrian Lighting
 - Combined Street/ Pedestrian Lighting
 - Pedestrian Lighting only (on existing pole)
- 2. Standard Pedestrian Lighting to be located within ROW

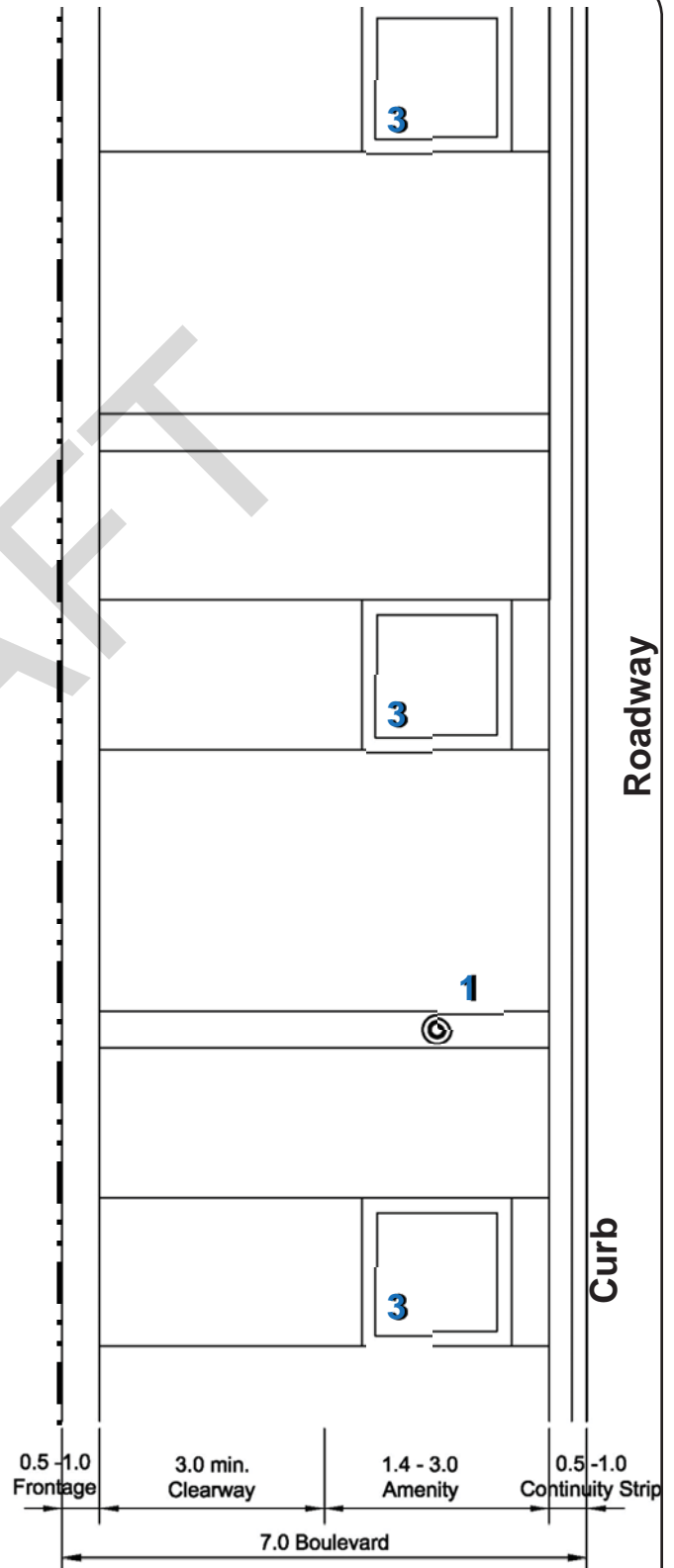
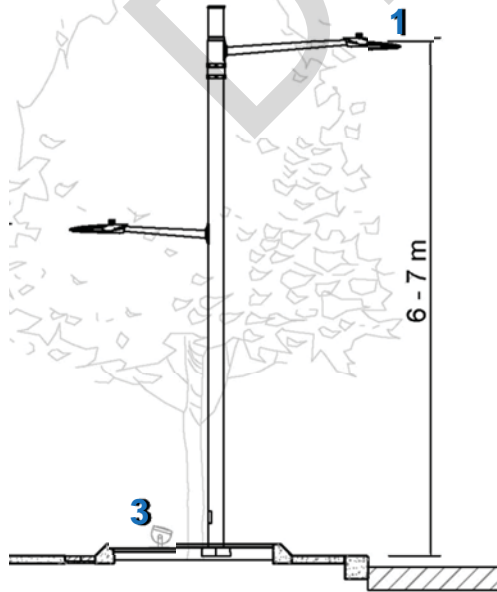


Premium

KEY

— R.O.W

1. Standard Lighting
 - Street Lighting
 - Pedestrian Lighting
 - Combined Street/ Pedestrian Lighting
 - Pedestrian Lighting only (on existing pole)
2. Standard Pedestrian Lighting to be located within ROW
3. Specialty
 - Bollard Lighting
 - Paving Lighting
 - Accent Lighting
 - Seatwall Lighting
 - Up-Lights
 - Wall Wash Lighting



Site Furnishings

Site furnishings act as a unifying element along the length of a streetscape. The combination of style, texture and colour convey a visual connection between areas and contribute to each area's individual identity. Site furnishings are often grouped intermittently and become subtle reminders of an area's theme.

Function

- Pedestrian amenity
- Support active transportation
- Character, identity and branding of an area

General Guidelines

- Site furnishings to be located in the amenity zone and not interfere with the pedestrian clearway zone.
- Site furnishings to be clustered and located in strategic locations to avoid visual clutter and most efficiently serve pedestrians. Locations include nodes, pedestrian trails, cycling amenities for cycling routes, rest points and bus stops.
- Site furnishings should be durable, vandal-resistant, replaceable and easily maintainable.
- Site furnishings should be comfortable and accessible for all seasons.
- Site furnishings should be selected collectively to ensure a consistent character and design.

Waste and Recycling Receptacles

- Receptacles should be two stream.
- Effort should be made to consider solar powered compactors, such as 'Big Belly Solar', in the future.

Benches

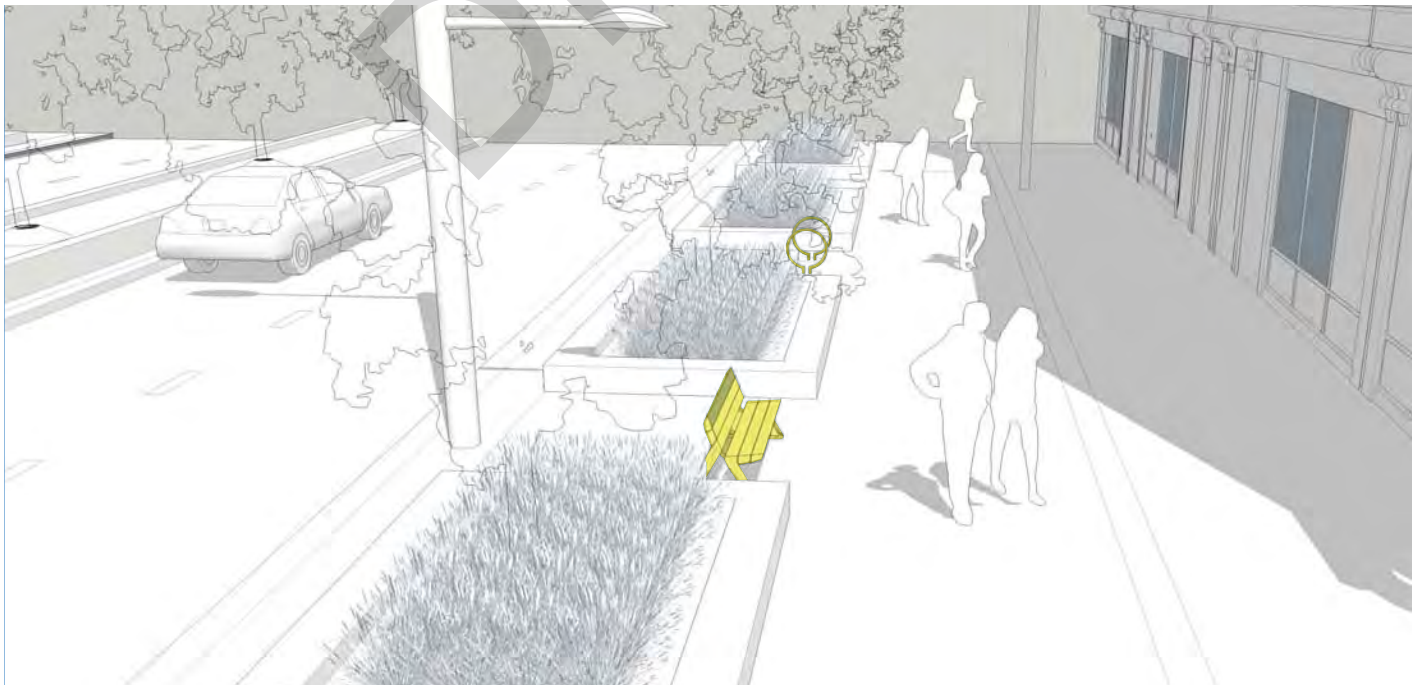
- Benches shall be minimum of 1.5 m in length to comfortably seat 2 to 3 individuals.

Bollards

- Removable or drop down bollards should be located at strategic locations for bus, emergency or service functions.
- Bollards should be of durable finish with concealed mounting.

Bicycle Stands

- Bicycle stands should be located at key nodes, destinations and streets that are part of the transit and cycling networks including park entrances, schools, civic and community buildings, key shopping areas and transportation hubs.
- Bicycle stands shall be located close to building entrances without interfering with pedestrian flow.



- Where possible, bicycle stands shall be located in a sheltered area for protection from elements.
- Bicycle stands shall be durable.
- Provide 0.75 m between each single bicycle stand.
- Provide 0.5 m between bicycle stands in the ROW and the clearway.
- Provide 0.5 - 0.7 m between bicycle stands and the curb with no on-street parking
- Provide 1.0 - 1.3 m between bicycle stands and the curb with on-street parking.
- Bicycle stands shall be installed on hardscape.
- Provide a concrete pad adjacent to the pedestrian clearway zone for bicycle stands where no hardscape for installation is available.
- Bicycle stands shall be powder coated and embedded with concrete footing.

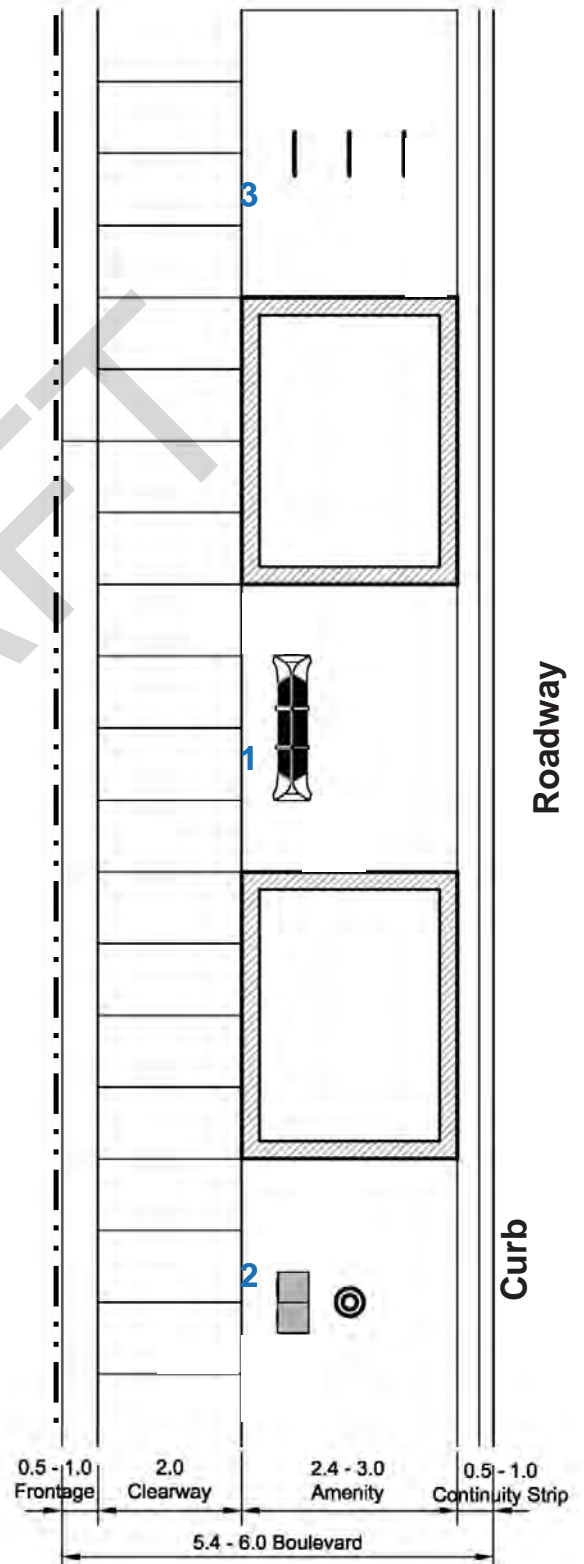


DRAFT

Enhanced

KEY

- R.O.W
- 1. Bench
- 2. Waste Receptacle / Recycle Unit
- 3. Bicycle Parking

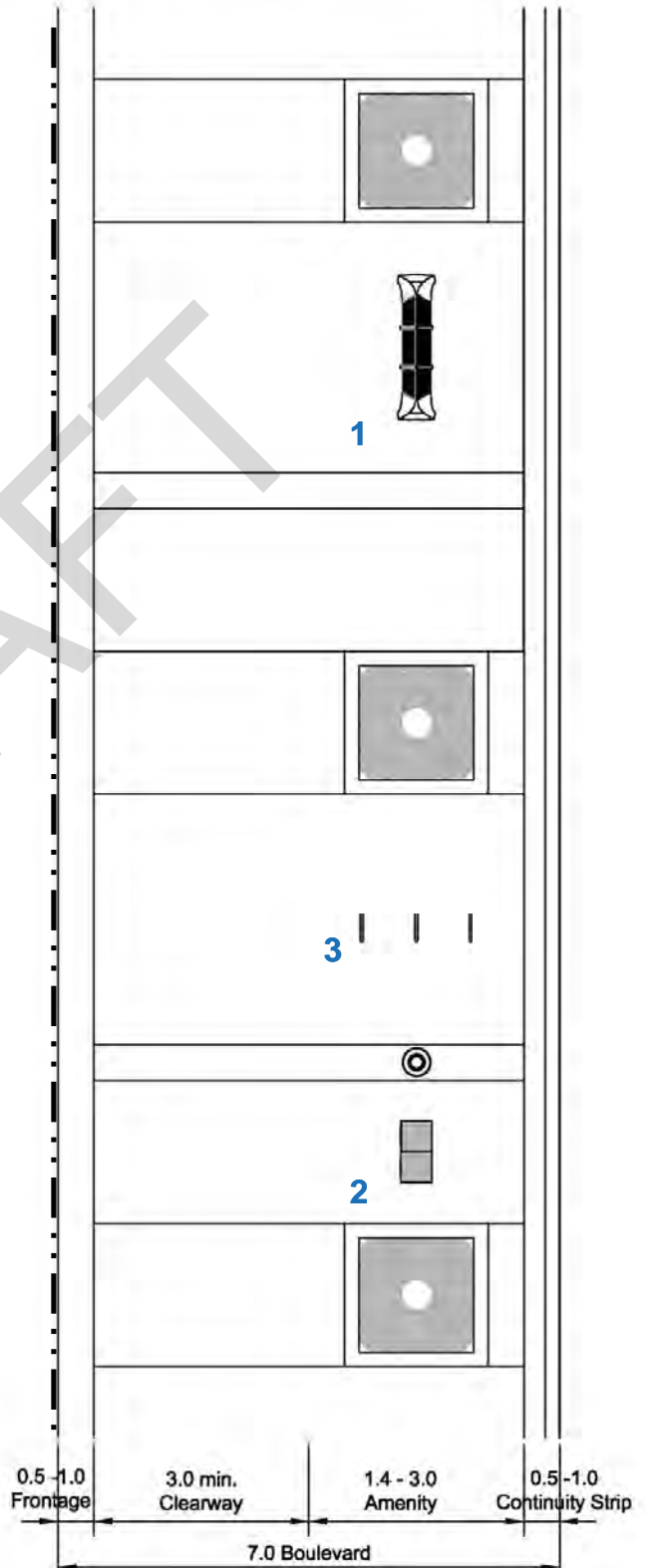


Note: Locations of site furnishings for illustration purposes only. Site Furnishings to be located per design and best practice.

Premium

KEY

- R.O.W
- 1. Bench
- 2. Waste Receptacle / Recycle Unit
- 3. Bicycle Parking



Note: Locations of site furnishings for illustration purposes only. Site Furnishings to be located per design and best practice.

Medians

The role of a median is more important to vehicular roadway functions; however, medians offer space for a variety of elements which contribute to the visual interest and aesthetic of an area. Medians also provide a refuge for pedestrians crossing large roadways at intersections.

Function

- Separate opposite directions of vehicular traffic.
- Pedestrian refuge for pedestrian crossings greater than 15 m in length.
- Space for visual aesthetic elements such as planting and public art.
- Space for character, identity, branding elements.

General Guidelines

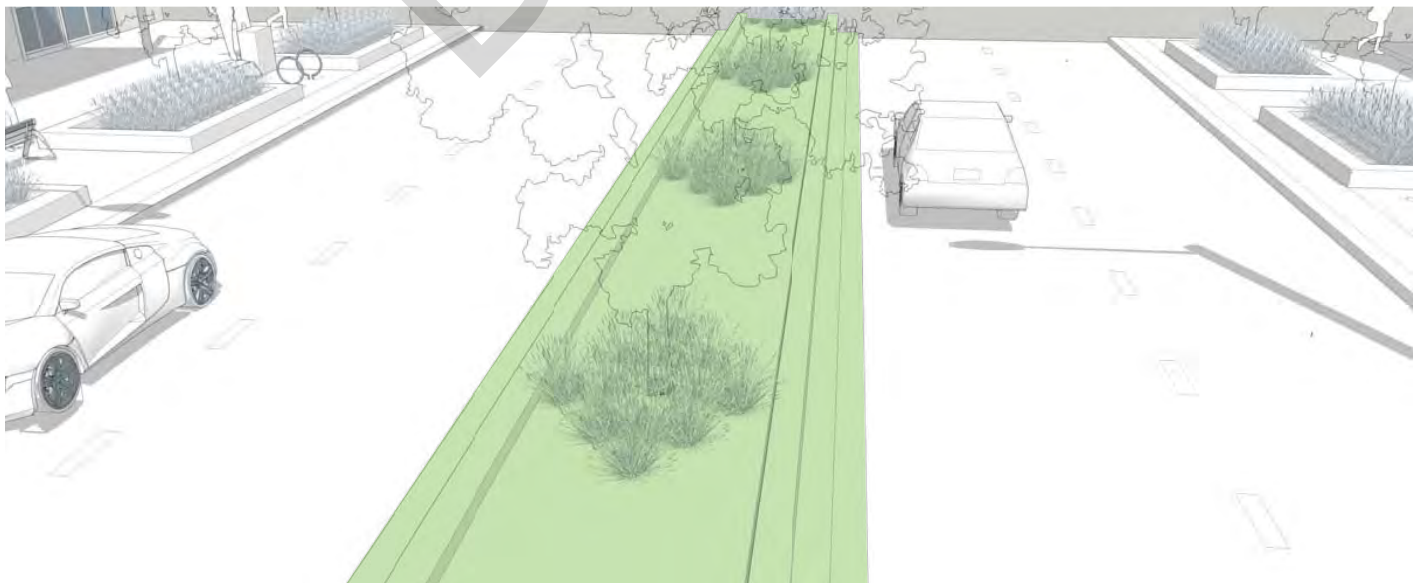
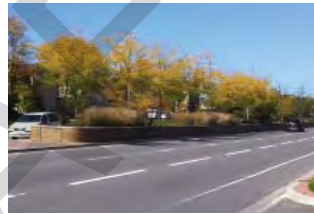
- No planting or visual obstructions should be located past the pedestrian crossing into the intersection.
- A continuous splash pad should be located on both sides of the median where the median is large enough for planting.

Pedestrian Crossing

- The median should provide clear access with no obstructions where pedestrian crossings cross the median.
- AODA ramps or drop curbs should be provided where pedestrian crossings cross the median.

Vegetation

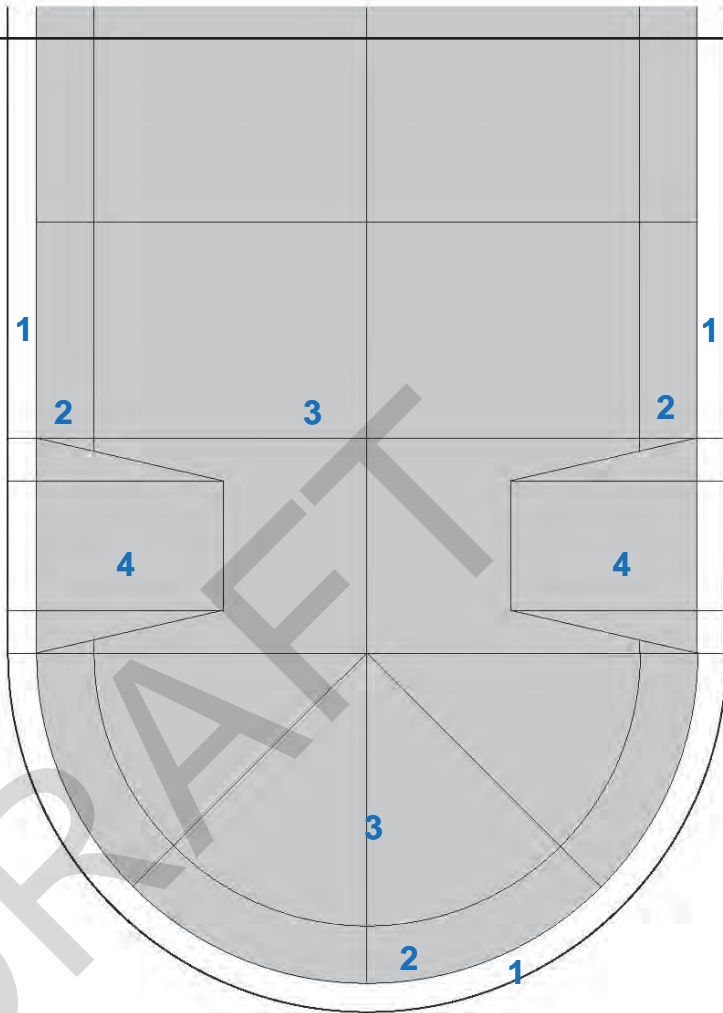
- Where trees or planting is located in the median, a raised planter curb is required to protect vegetation from road salt.
- Shrubs, perennials and ornamental grasses used in the median should be short enough so as not to obstruct sight lines near intersections.
- Where planting is included in the median, the median should have a minimum width of 4 m for shrub and ornamental planting and a minimum width of 6 m for tree planting.
- Planting in the median should be salt and drought tolerant for greatest success of survival (see Appendix E for Salt and Drought Tolerant Species List).



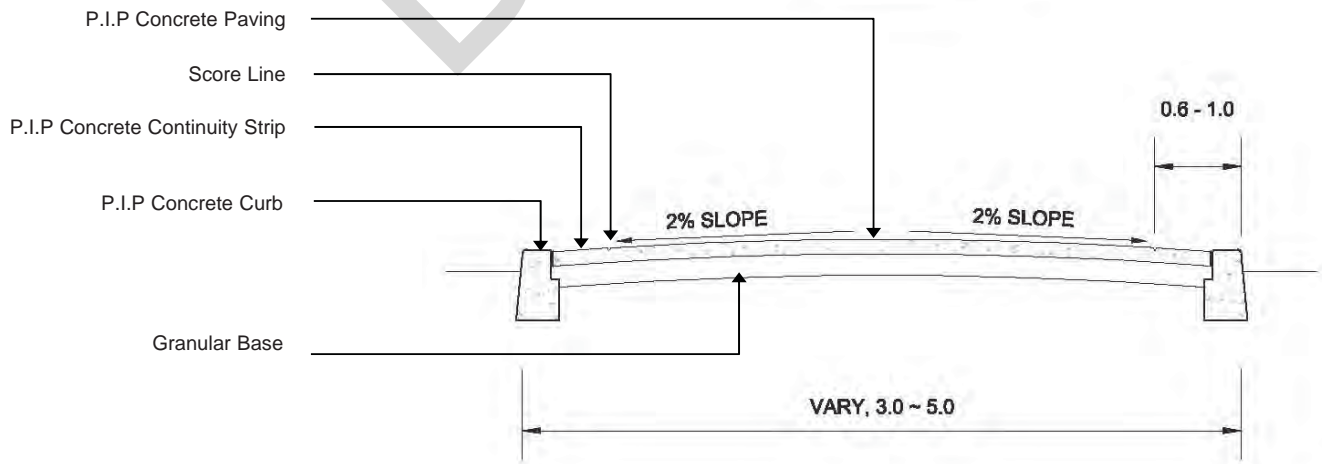
Standard Urban Hardscape

KEY

- 1. P.I.P Concrete Curb
- 2. P.I.P Concrete Continuity Strip
- 3. P.I.P Concrete Paving
- 4. AODA Ramp and Drop Curb



PLAN

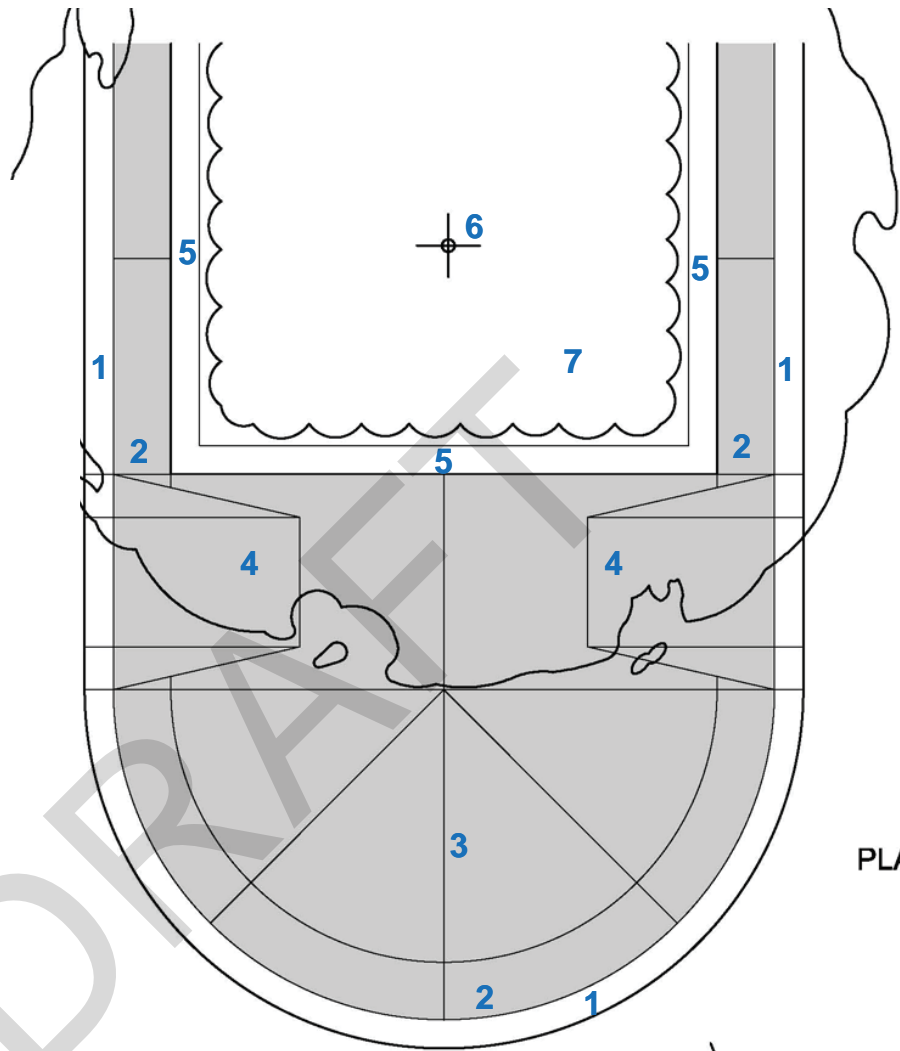


SECTION

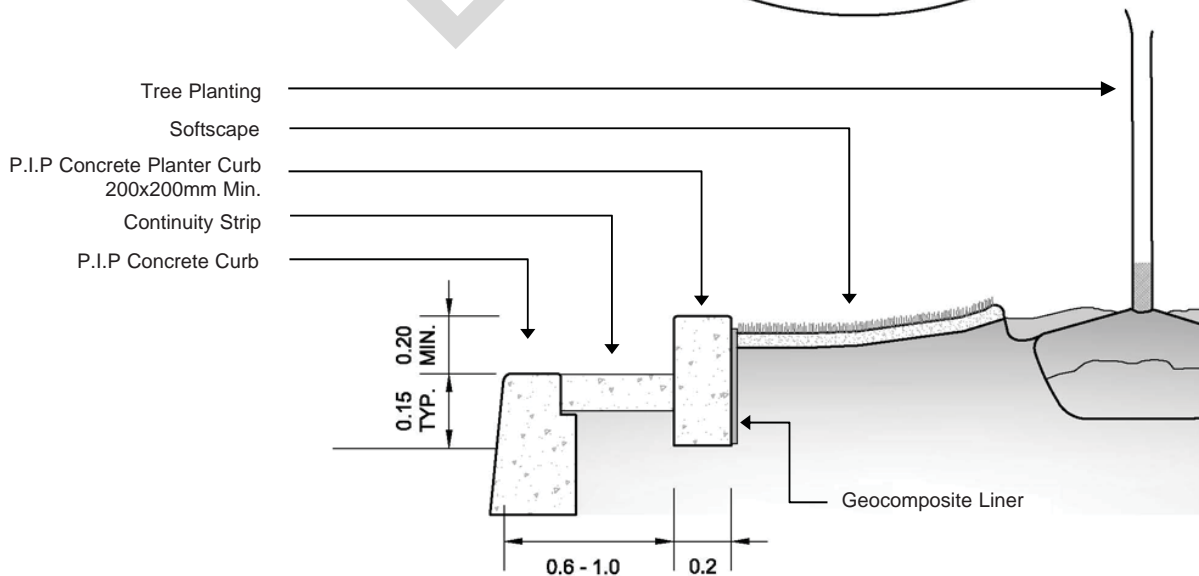
Enhanced Hardscape

KEY

- 1. P.I.P Concrete Curb
- 2. P.I.P Concrete Continuity Strip
- 3. P.I.P Concrete Paving
- 4. AODA Ramp and Drop Curb
- 5. P.I.P Concrete Planter Curb 200x200mm Min.
- 6. Tree Planting
60mm Caliper for Deciduous
2.0m Height for coniferous
- 7. Softscape
Sod
Mulch
Perennials
Ornamental Grass
Deciduous Shrub 600mm Height
Coniferous Shrub 600mm Height



PLAN

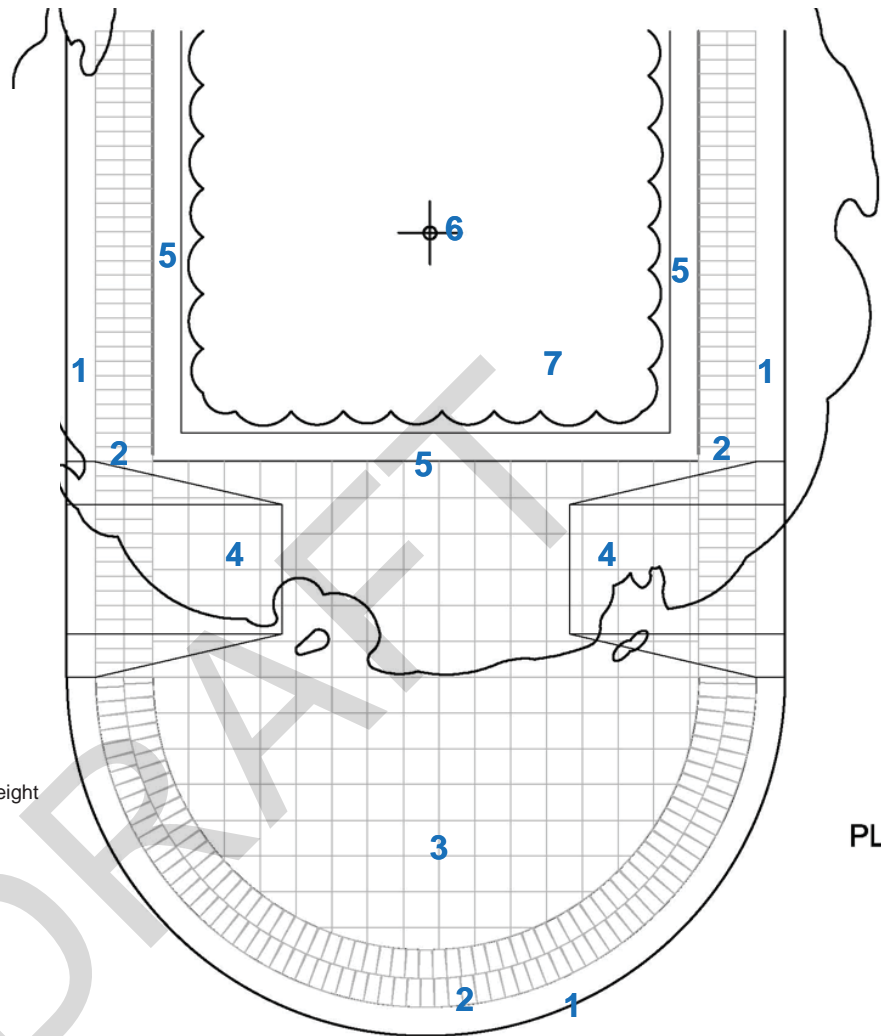


SECTION

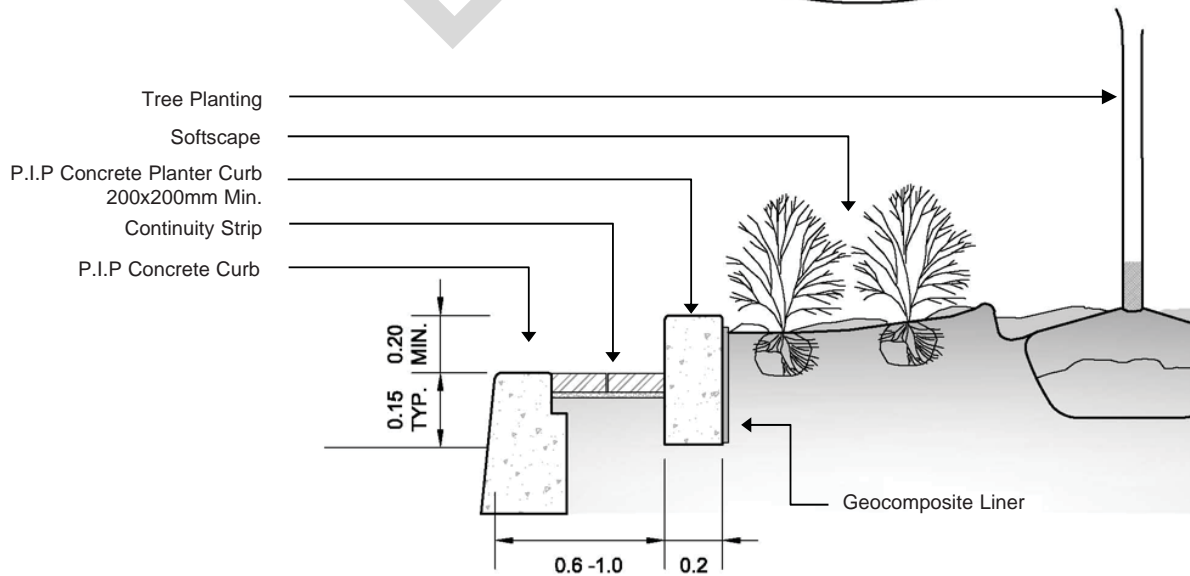
Premium Hardscape

KEY

- 1. P.I.P Concrete Curb
- 2. Continuity Strip
Material Options:
P.I.P concrete Paving
Pre-cast Concrete Unit Paver
Permeable Paving
- 3. Field Paving
Material Options:
P.I.P concrete Paving
Pre-cast Concrete Unit Paver
Permeable Paving
- 4. AODA Ramp and Drop Curb
- 5. P.I.P Concrete Planter Curb
200x200mm Min.
- 6. Tree Planting
60-80mm Caliper for Deciduous
2.0-2.5m Height for coniferous
- 7. Softscape
Sod
Mulch
Perennials
Ornamental Grass
Deciduous Shrub 600mm-1500mm Height
Coniferous Shrub 600mm Height



PLAN

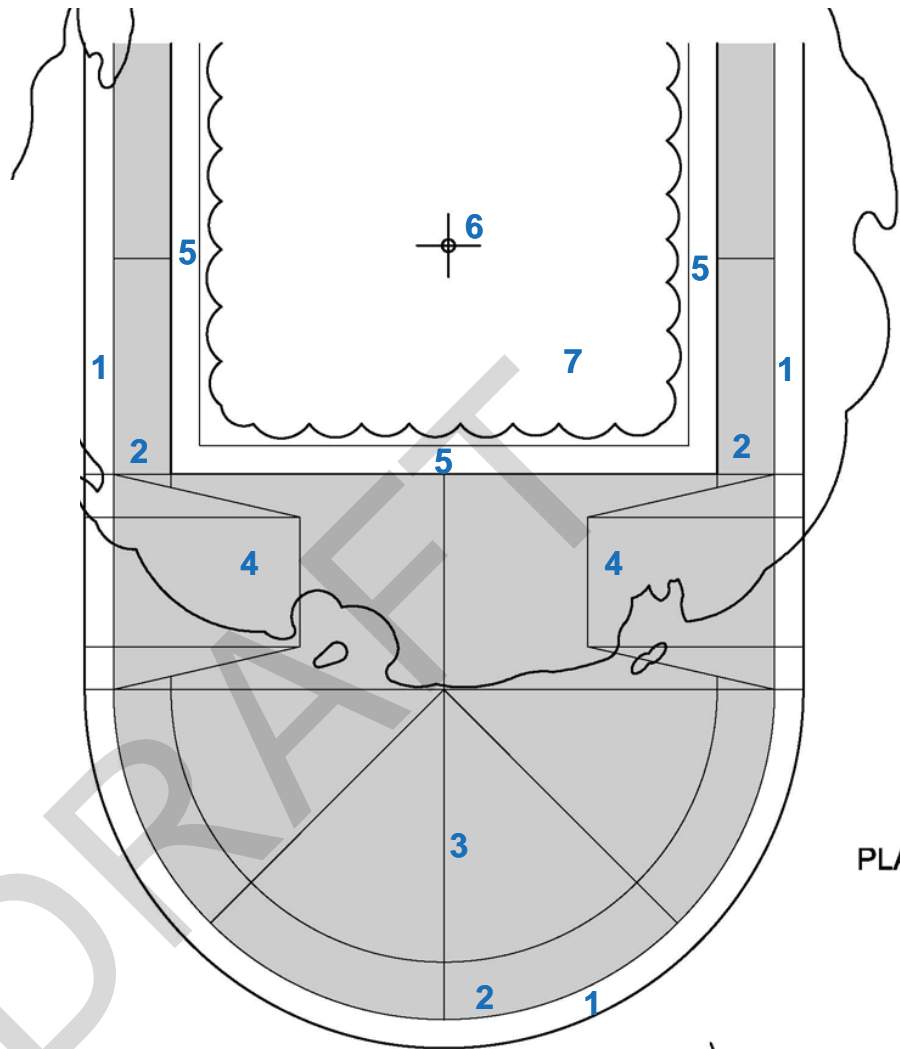


SECTION

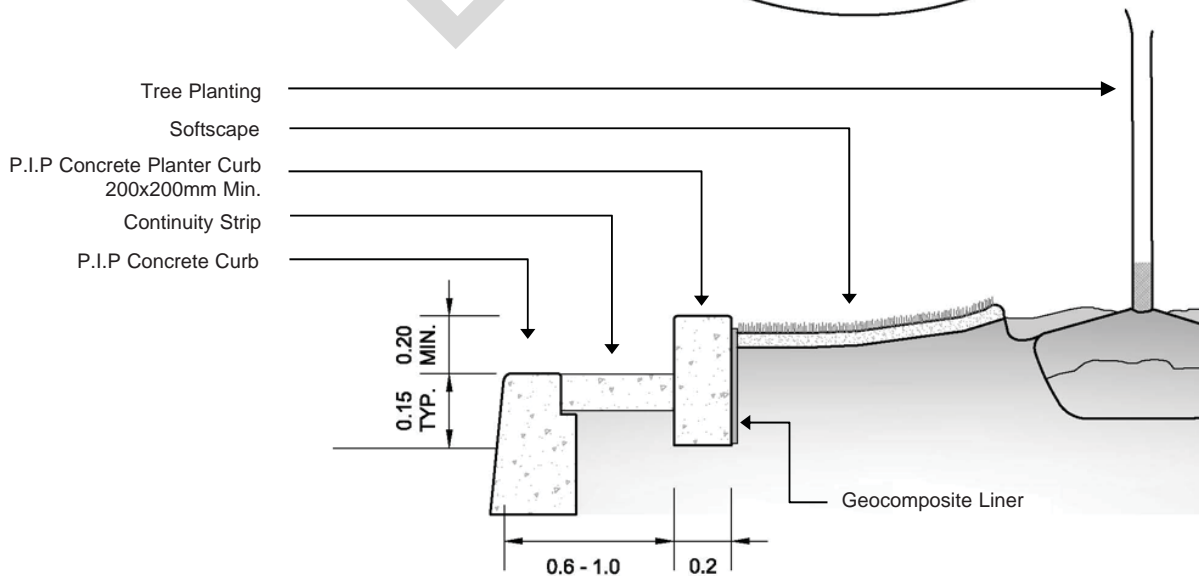
Standard Urban Softscape

KEY

- 1. P.I.P Concrete Curb
- 2. P.I.P Concrete Continuity Strip
- 3. P.I.P Concrete Paving
- 4. AODA Ramp and Drop Curb
- 5. P.I.P Concrete Planter Curb 200x200mm Min.
- 6. Tree Planting
60mm Caliper for Deciduous
2.0m Height for coniferous
- 7. Softscape
Sod
Mulch
Perennials
Ornamental Grass
Deciduous Shrub 600mm Height
Coniferous Shrub 600mm Height



PLAN

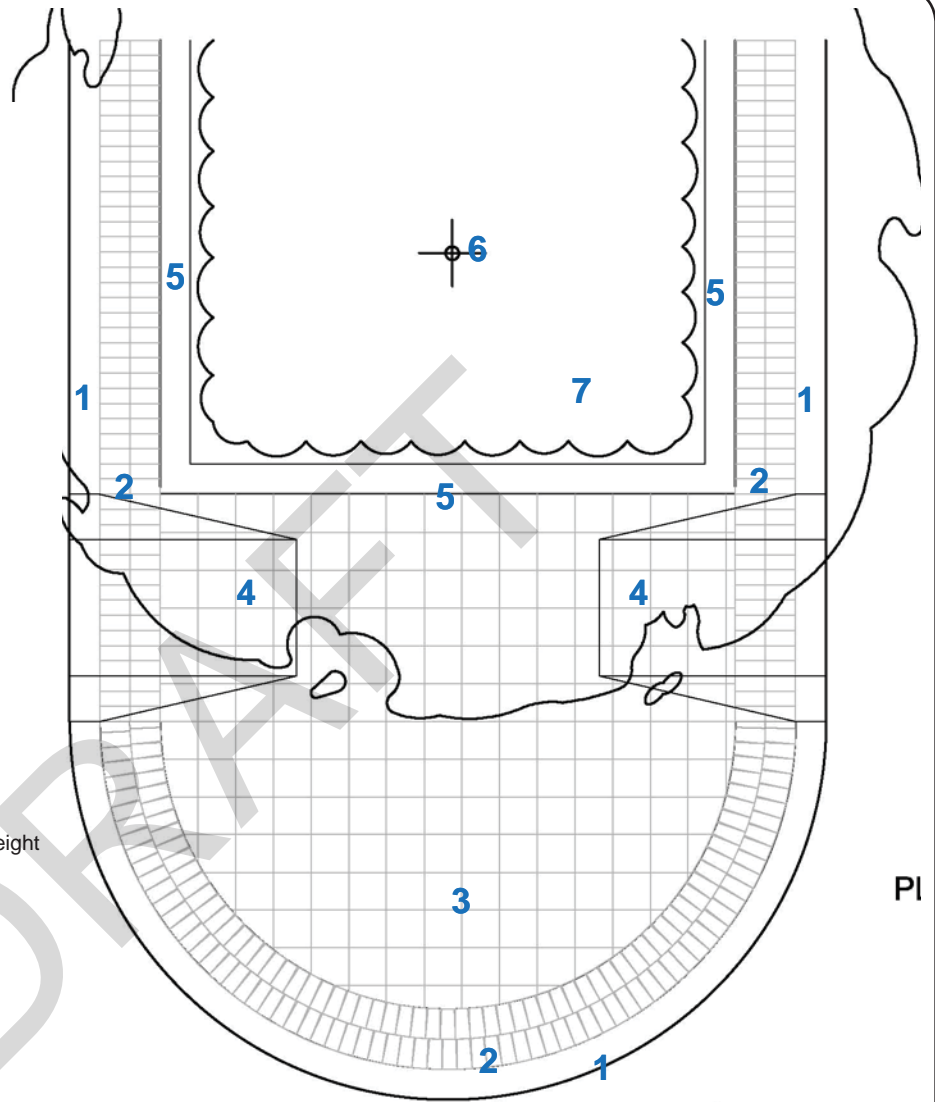


SECTION

Enhanced Softscape

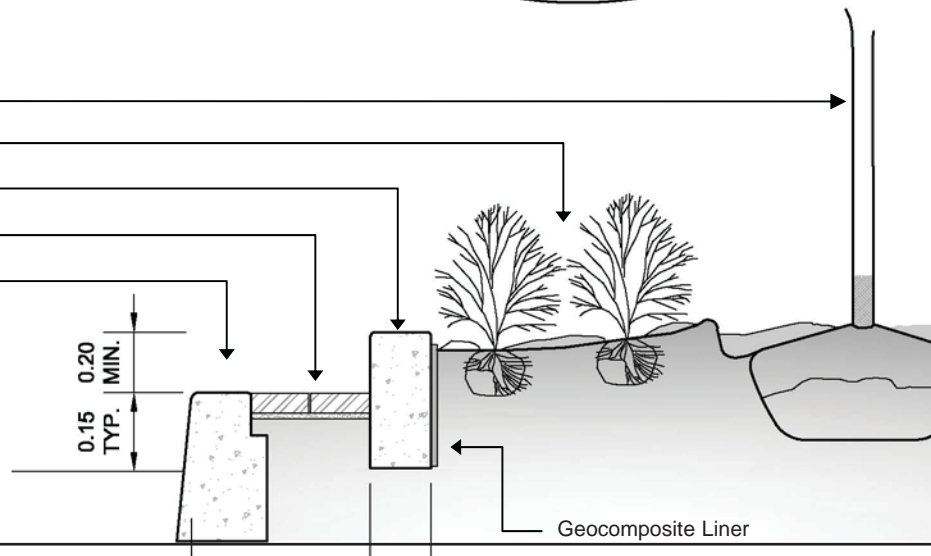
KEY

- 1. P.I.P Concrete Curb
- 2. Continuity Strip
Material Options:
P.I.P concrete Paving
Pre-cast Concrete Unit Paver
Permeable Paving
- 3. Field Paving
Material Options:
P.I.P concrete Paving
Pre-cast Concrete Unit Paver
Permeable Paving
- 4. AODA Ramp and Drop Curb
- 5. P.I.P Concrete Planter Curb
200x200mm Min.
- 6. Tree Planting
60-80mm Caliper for Deciduous
2.0-2.5m Height for coniferous
- 7. Softscape
Sod
Mulch
Perennials
Ornamental Grass
Deciduous Shrub 600mm-1500mm Height
Coniferous Shrub 600mm Height



PI

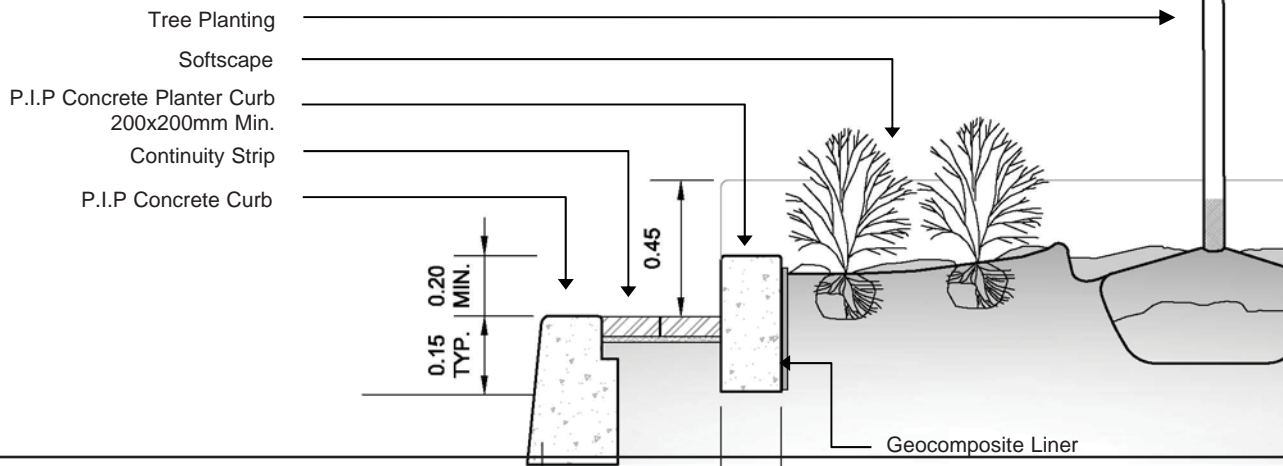
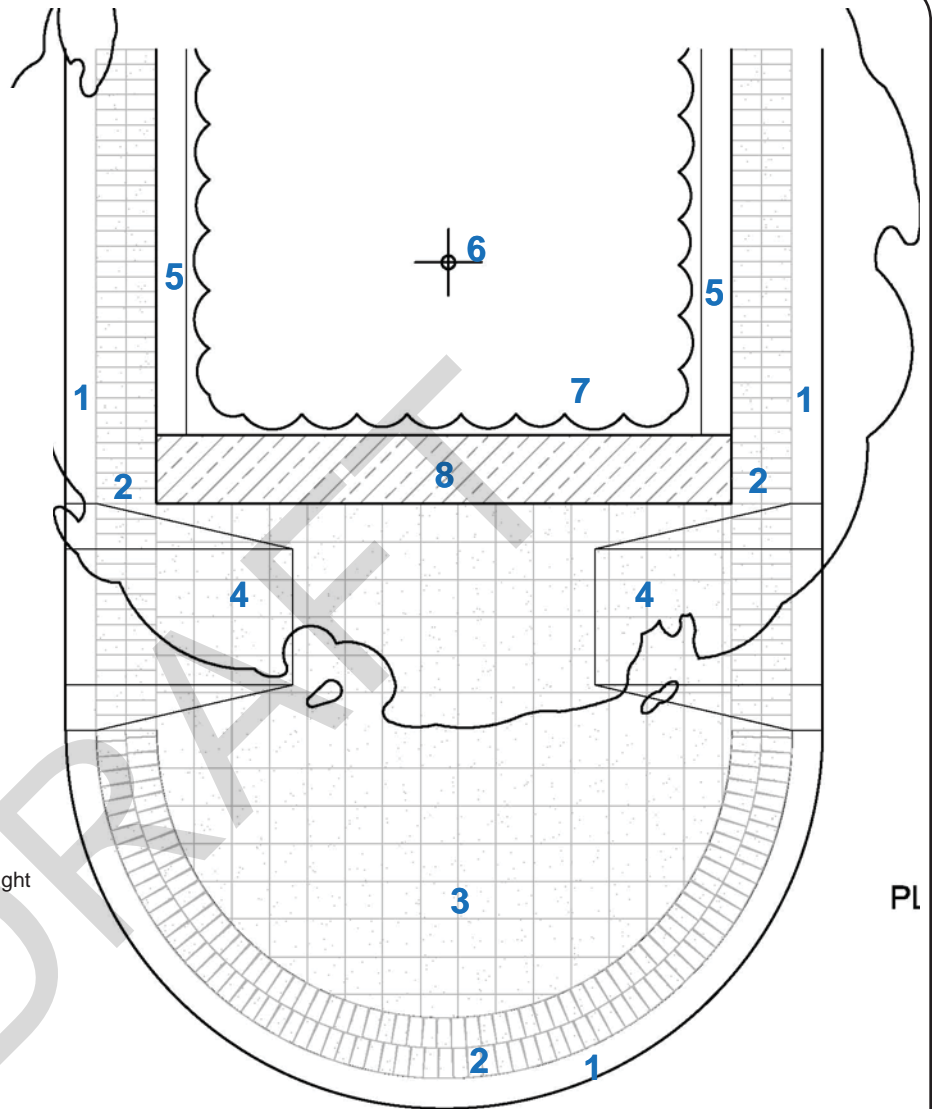
- Tree Planting
- Softscape
- P.I.P Concrete Planter Curb
200x200mm Min.
- Continuity Strip
- P.I.P Concrete Curb



Premium Softscape

KEY

1. P.I.P Concrete Curb
2. Continuity Strip
Material Options:
P.I.P concrete Paving
Pre-cast Concrete Unit Paver
Natural Stone Paver
Permeable Paving
3. Field Paving
Material Options:
P.I.P concrete Paving
Pre-cast Concrete Unit Paver
Natural Stone Paver
Permeable Paving
4. AODA Ramp and Drop Curb
5. P.I.P Concrete Planter Curb
200x200mm Min.
6. Tree Planting
60-100mm Caliper for Deciduous
2.0-3.0m Height for coniferous
7. Softscape
Sod
Mulch
Perennials
Ornamental Grass
Deciduous Shrub 600mm-1500mm Height
Coniferous Shrub 600mm Height
8. 450mm Seatwall Planter Curb



Intersections

Clear visual communication at intersections is important to reduce potential conflict between vehicles, cyclists and pedestrians.

Function

- Location for vehicular and pedestrian traffic to cross or change directions.
- Transition zone between different block streetscape characters and types.
- Space for character, identity and branding of an area.
- Space for gateway identifiers and public art.

Major Intersections

- Major intersections are to be divided into the pedestrian corner treatment zone, transition zone and mid-block. The pedestrian corner treatment zone is to be 30 m from the intersection curb, where allowed. The transition zone is to be 8 - 20 m.
- Potential space for public art must be provided.
- Public / private space must be provided connected to the pedestrian corner treatment zone at gateways.

Minor Intersections

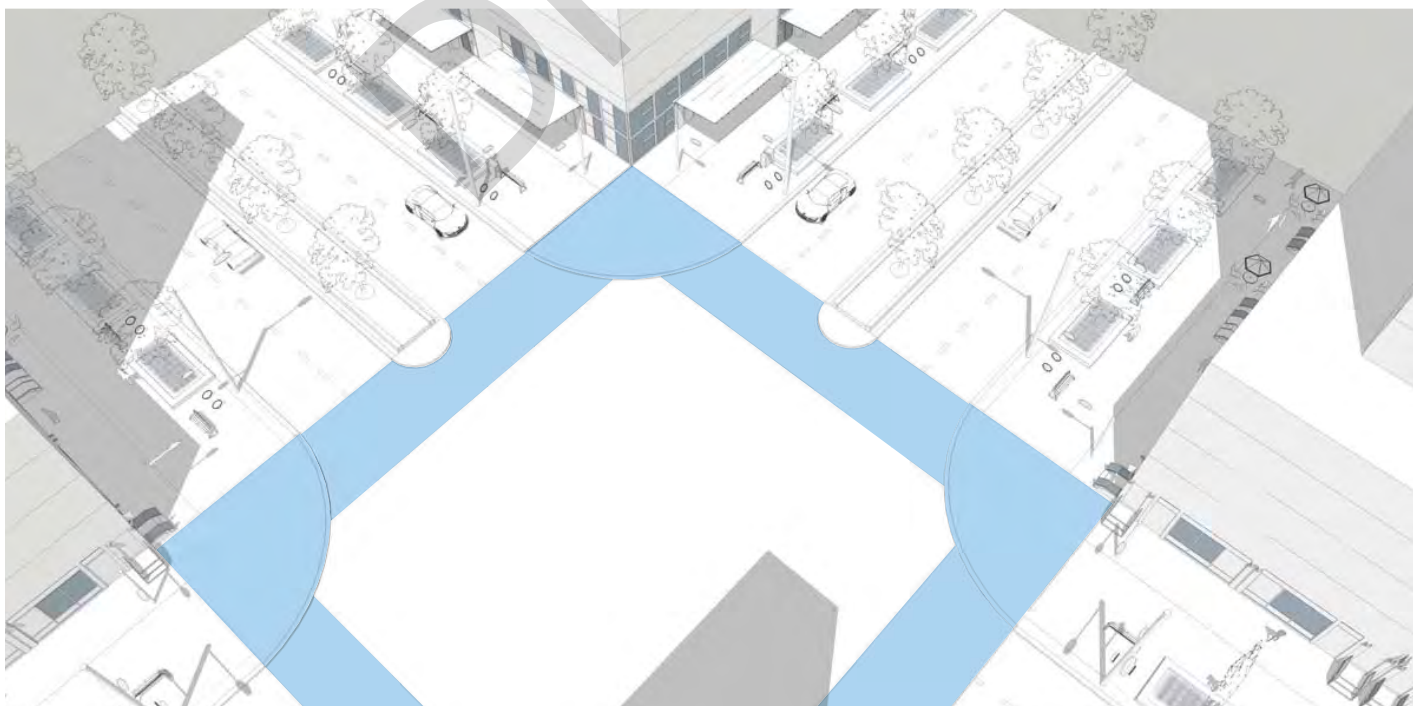
- Minor intersections are to be divided into the pedestrian corner treatment zone and mid-block. The pedestrian corner treatment zone is to be 10 m from the intersection curb.

Pedestrian Corner Treatment

- Pedestrian corner treatments provide pedestrian refuge and stacking prior to roadway crossings.
- AODA ramps or drop curbs should be provided at pedestrian crossings.
- Tactile walking surface indicators on curb ramps should be provided to comply with AODA Accessibility Standard for the Design of Public Spaces.

Intersection Transition Zone

- Transition zones provide notice to pedestrians that an intersection is approaching.
- Rhythm of street trees should decrease in frequency to increase visual sight lines for vehicles and pedestrians approaching the intersection.
- Paving design in the transition zone should be complimentary but differ from mid-block conditions.
- Street furniture at intersections should be located in the transition zone, where appropriate.



Pedestrian Crosswalks

- Pedestrian crosswalks provide a safe crossing facility for pedestrians with the shortest distance possible across the vehicular roadway.
- Pedestrian crosswalks must be clearly delineated from the roadway by unique paving or markings.
- Crosswalk treatments should be durable to remain clearly visible to pedestrians and motorists.
- Pedestrian crosswalk markings and treatments should be clear and consistent to avoid pedestrian confusion.
- Pedestrian crosswalks may contain unique markings and colours to reflect the area's identity and branding.
- Raised pedestrian crosswalks should be considered where possible to facilitate accessible and safe crossings.
- When pedestrian crossings are greater than 15 m in length, medians should be considered to provide a pedestrian refuge point.
- Pedestrian crosswalks to be a minimum of 2.5 m wide.
- Pedestrian crosswalks should be positioned 90 degrees from the curb to create the shortest crossing distance.
- Pedestrian crosswalks must be consistent with guidelines in the Ontario Traffic Manuals.

Curb Extensions

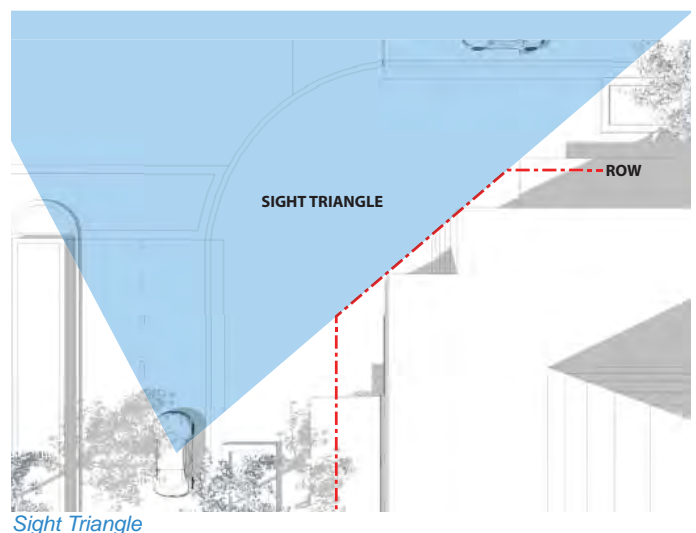
- Curb extensions, or “bump outs” provide passive traffic calming, define space for on-street parking and public transit boarding, and reduce pedestrian crosswalk distances.
- The use of curb extensions is encouraged where appropriate on streets with on-street parking.
- Consider curb extensions as potential areas for planting, special paving and fire hydrants.

Cycling Facilities at Intersections

- Cycling facilities at intersections allow for greater safety between competing modes of transportation (motor vehicles, cyclists and pedestrians).
- When bike boxes are used in the roadway, they should be clearly defined, unique visually from the pedestrian crosswalk and located behind the pedestrian crosswalk.
- Bike lane line markings / patterns should not extend through pedestrian crosswalks with the exception of dashed lines in complex intersections.

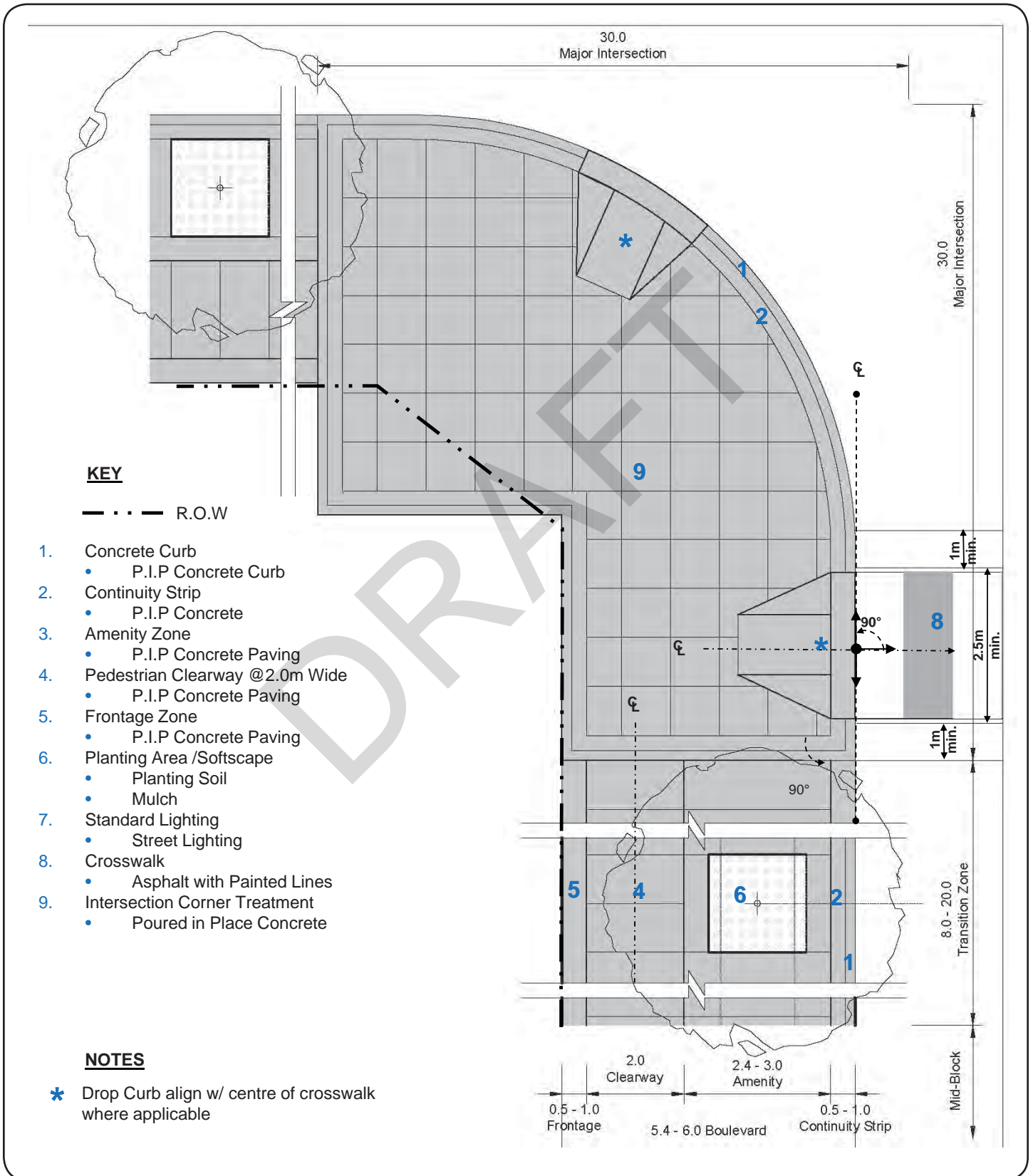
Site Triangles

- Sight triangles should provide clear visibility between all modes of transportation in the intersection to ensure safety from collisions.
- The sight triangle should be clear of obstacles which may block a vehicles view of pedestrians, cyclists and other vehicles traveling into the intersection.
- Sight triangles should be lit to ensure clear vision during the night time.
- On-street parking should be set back from the crosswalk to ensure clear sight lines.
- Shrubs and plants should be no higher than 0.8 m in height at maturity within sight triangles.
- Street furniture, if located in the sight triangle, should be no higher than 0.8 m in height.
- Trees should not be closer than 9 m from the intersecting curb face.
- If the tree canopy encroaches into the sight triangle, it should maintain a clear vertical clearance of 2.4 m or be trimmed.
- Site triangles should be designed as a continuation of the urban streetscape and not left empty to minimize the site triangle visual impact.
- Streetscape furniture, paving and small tree and shrub planting should still be included in the site triangle provided that they follow the TAC Geometric Design Manual sight triangle design criteria.

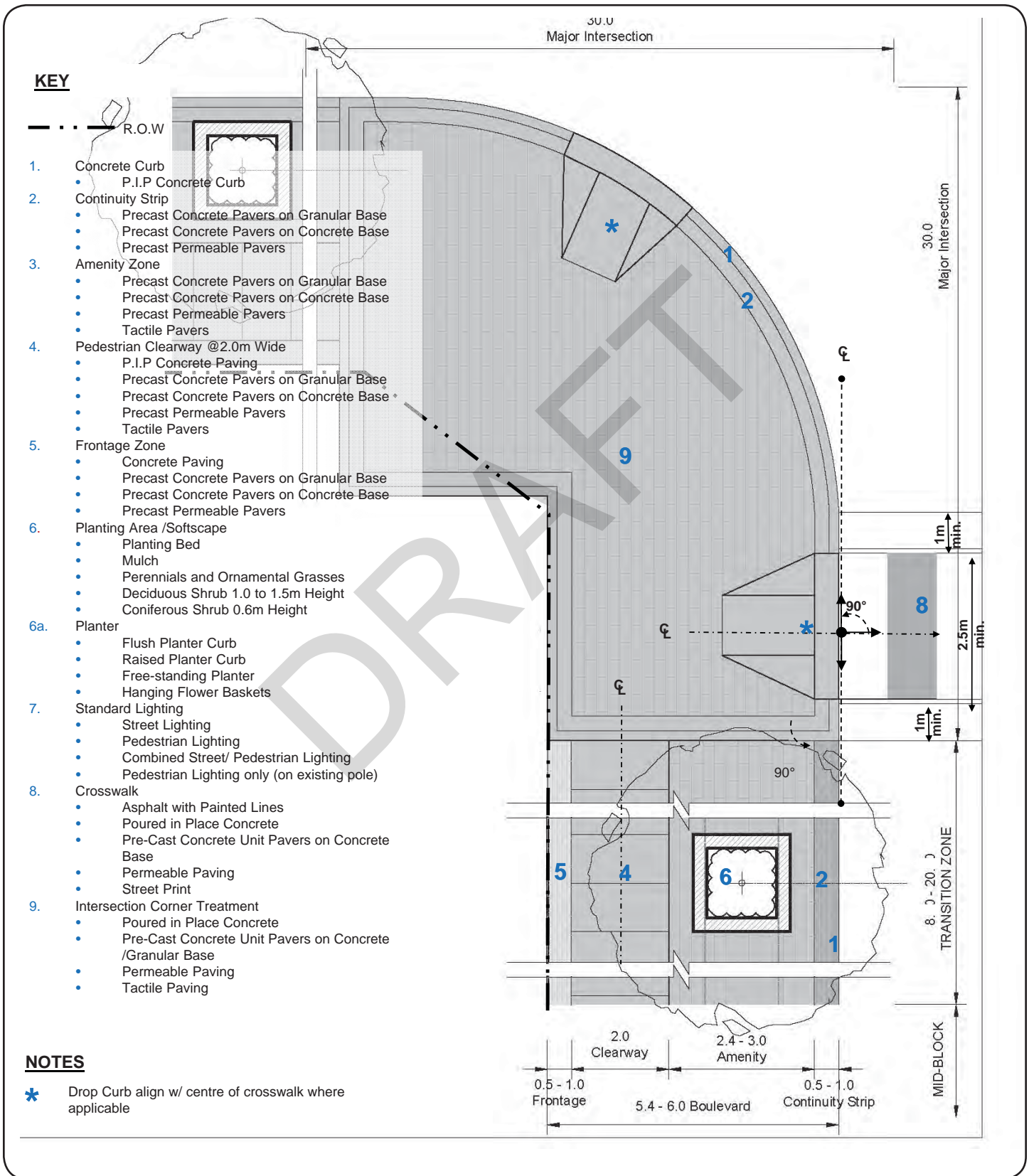


Sight Triangle

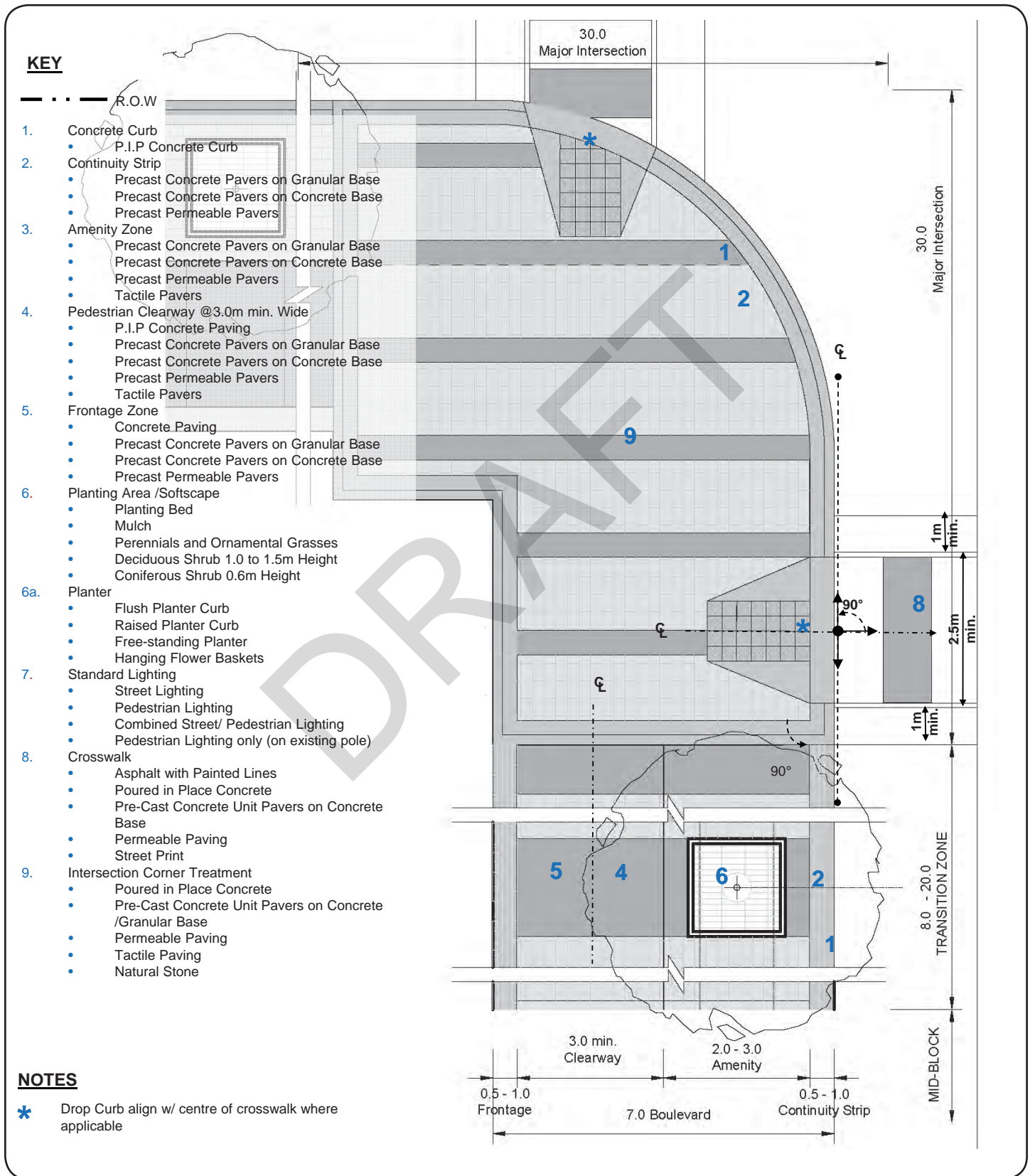
Standard Urban Major Intersection



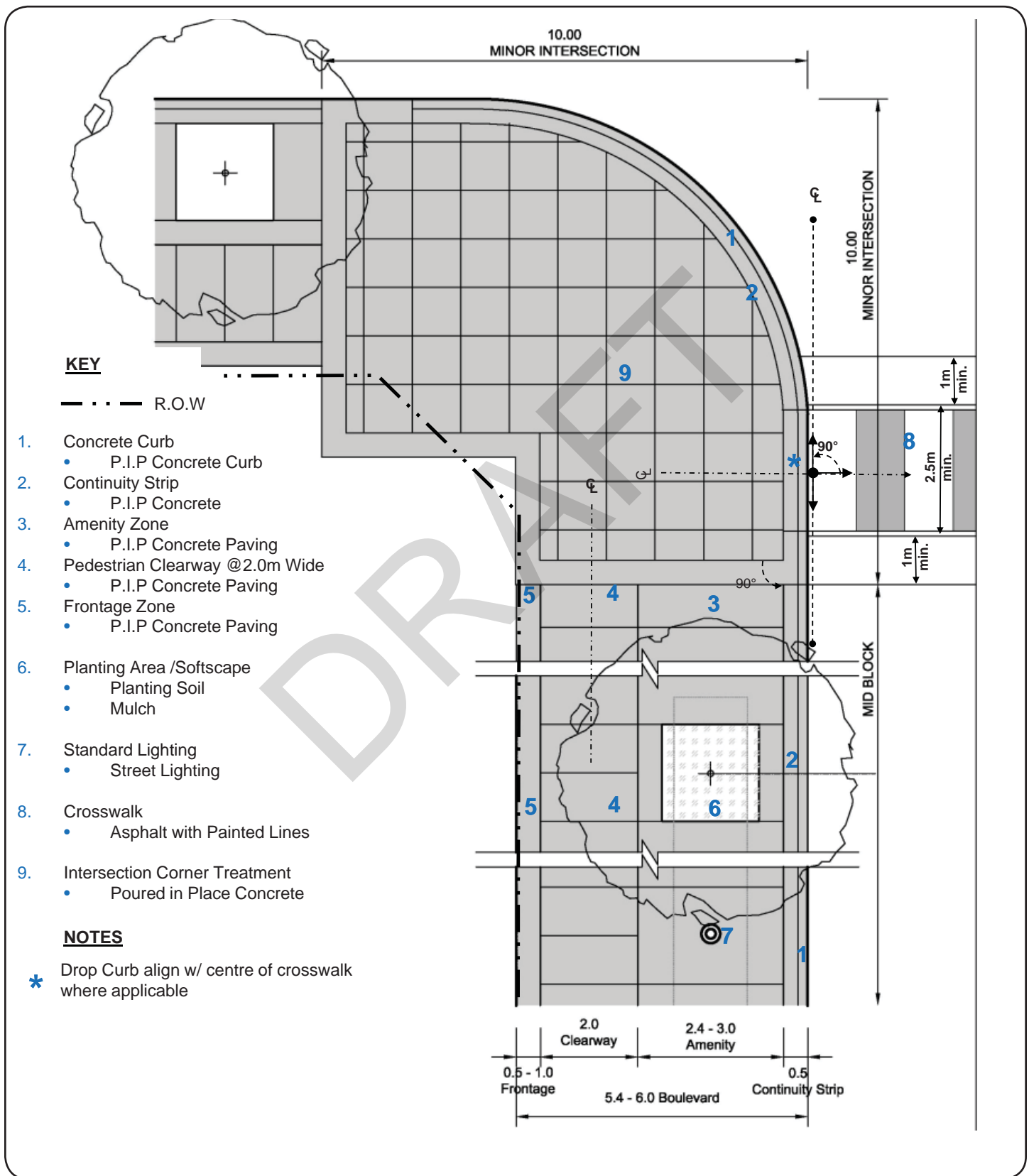
Enhanced Major Intersection



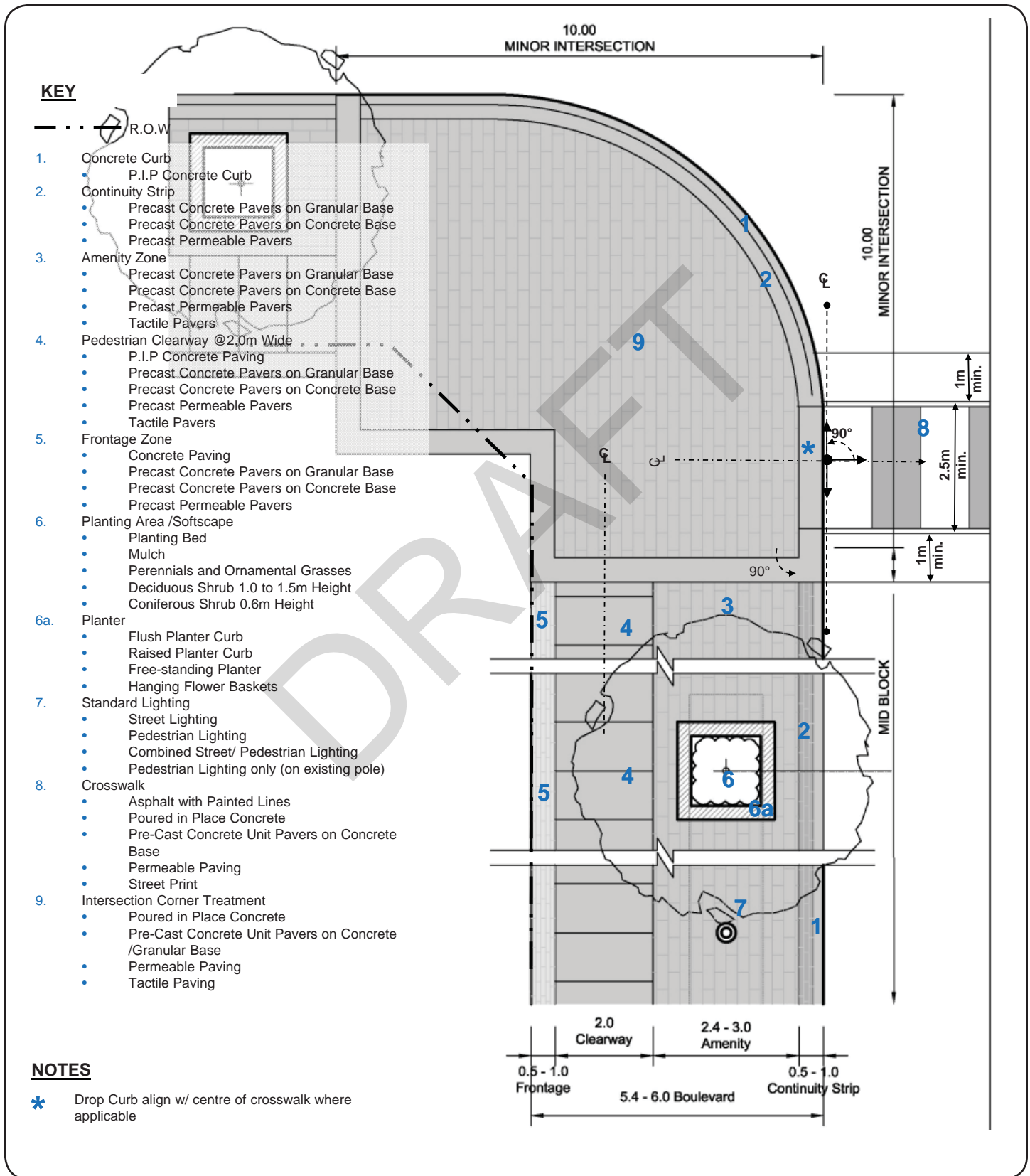
Premium Major Intersection



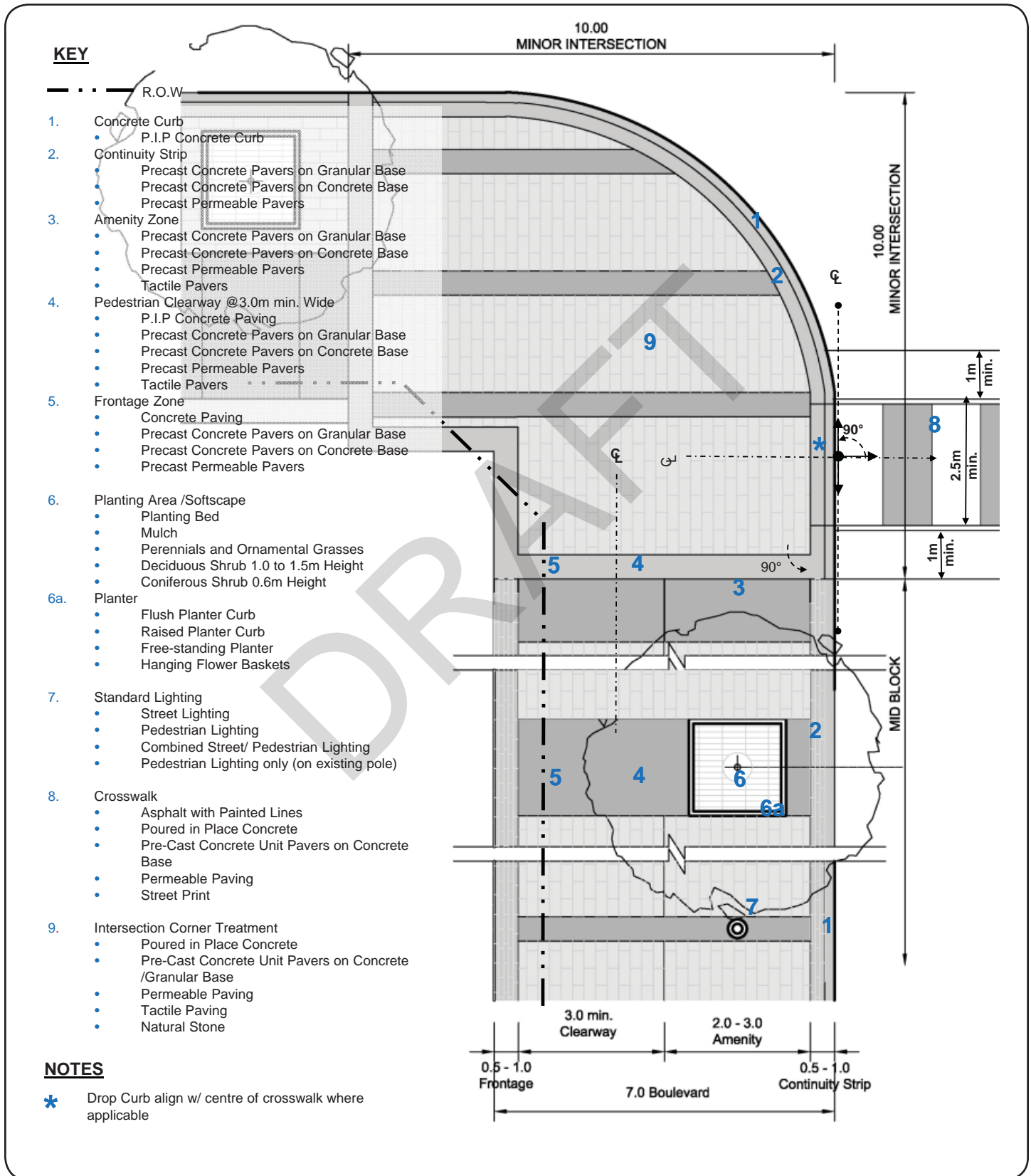
Standard Urban Minor Intersection



Enhanced Minor Intersection



Premium Minor Intersection



Public / Private Frontage

Adjacent to the frontage zone, between the ROW and the building face is the private frontage zone. While this is outside of the public pedestrian boulevard, the treatment of the zone is important to consider as it influences pedestrian interaction with adjacent buildings. The importance and design of the private frontage changes according to the adjacent land-use and streetscape type.

Typically, this zone is used for building entrances, outdoor cafes, marketing display areas, landscaping and public art.

Two functions typically determine how the public / private frontage is treated:

- Activity
- Semi-private

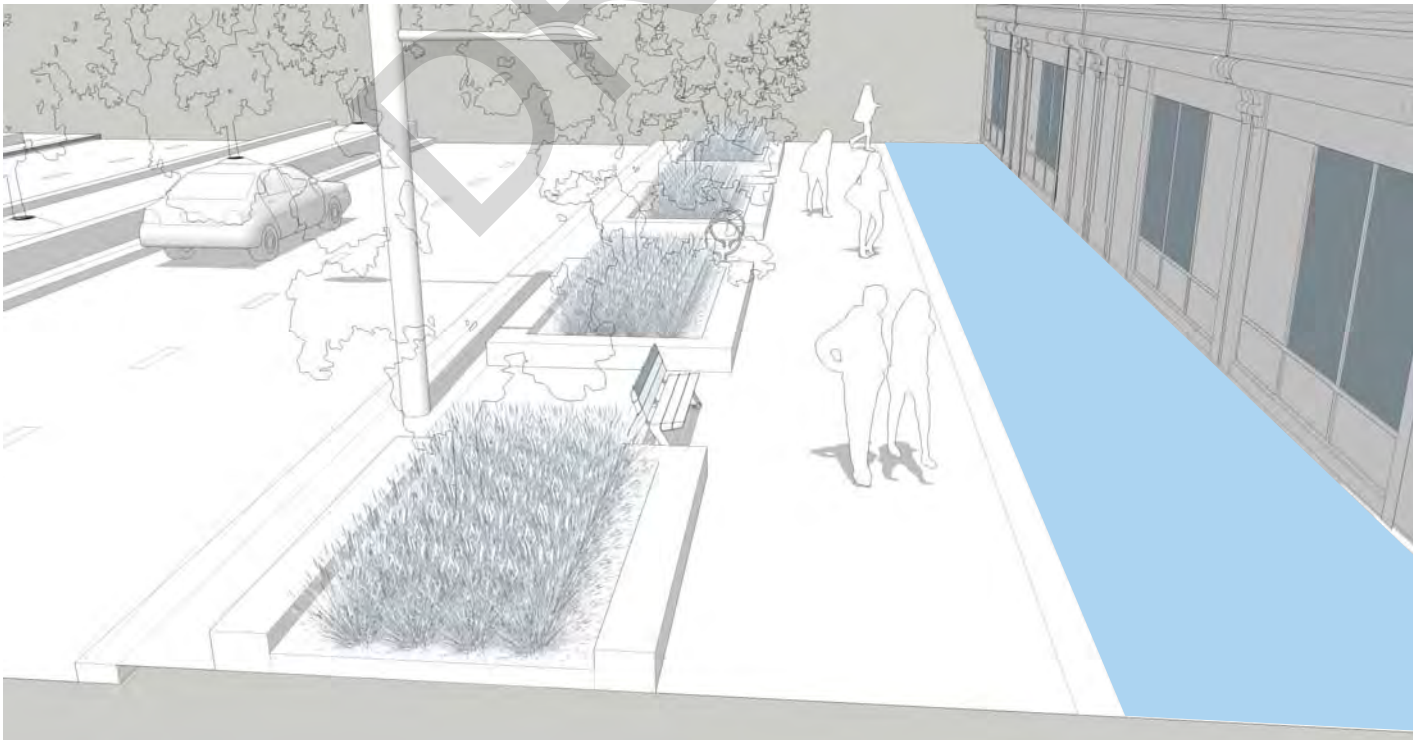
Activity

Activity functions of the public private frontage are areas of high volume pedestrian traffic and interaction between the public and private realm. Potential uses for public / private frontage activity areas include:

- Entrances to buildings
- Outdoor cafes
- Information kiosks and displays
- Landscaping
- Public art

General treatments include:

- Paving should be continuous and / or complimentary to the paving located in the adjacent pedestrian boulevard.
- Paving may be used to provide definition between public and private space to aid maintenance activities.
- Canopies may be permitted above the public / private frontage.
- Where public art is planned, canopy / public art coordination between architect and artist is required.



- Temporary / movable landscape displays / planters.
- Where night time activities are present, such as cafes, restaurants, shopping and entertainment, provide supplementary lighting for safety and security.
- Emphasize consolidated building entrances with creative landscaping, including movable planters, and lighting.
- Where appropriate, provide additional seating to accommodate private land uses such as retail, commercial, cafes and around public art.

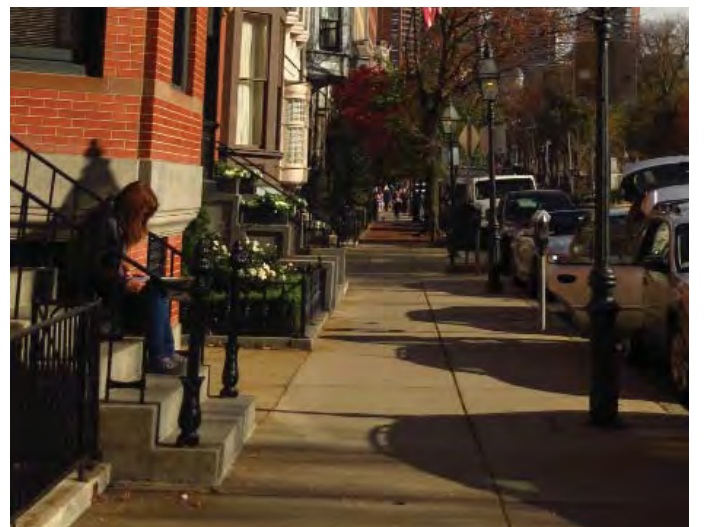
Semi-Private

Semi-private functions of the public private frontage act as semi-visual and semi-physical barriers between public and private areas. The zone acts as a transition zone and provides a measure of privacy and screening. Potential uses for public / private frontage semi-private areas include:

- Private residential entrances
- Private residential yards
- Landscaping

General treatments include:

- Vegetative screening treatments shall include barrier vegetation such as small trees, shrubs, perennials and ornamental grasses.
- Physical barriers including yards, planters, stairs, gates and fences.



Utilities

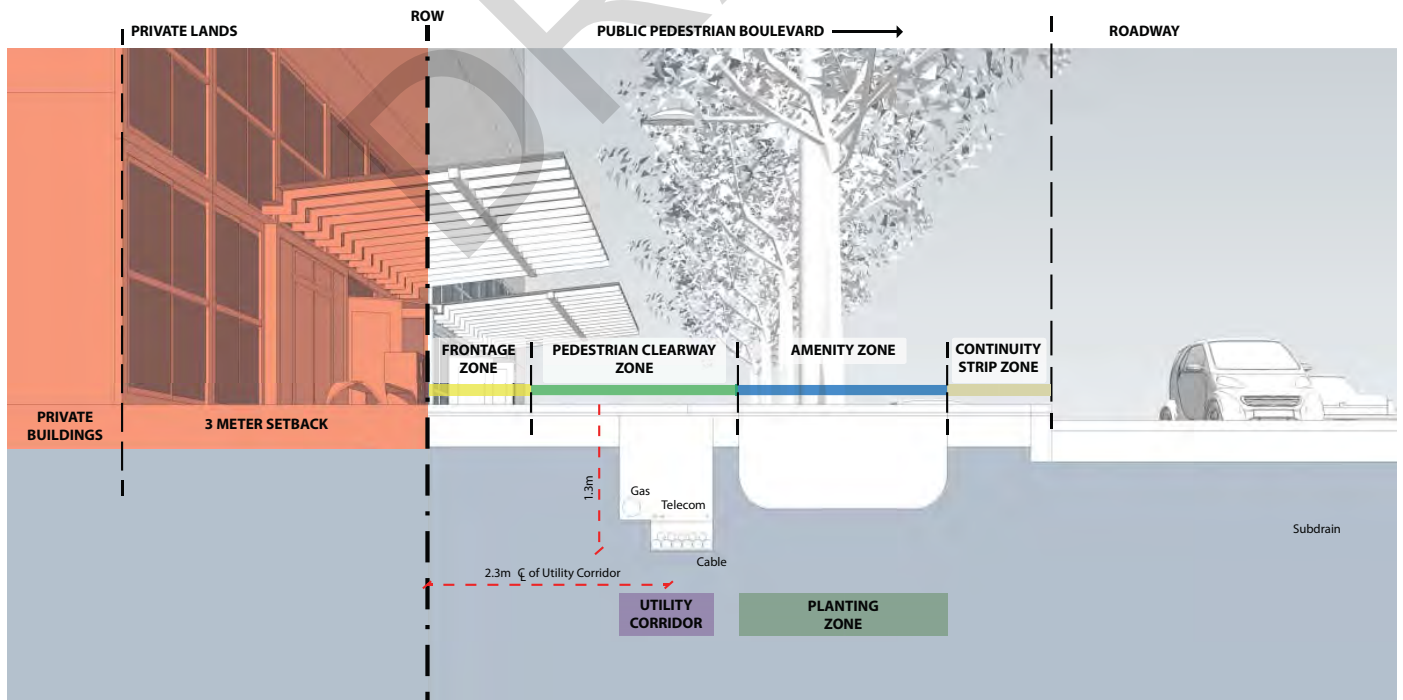
Natural Gas, electrical, telecommunications, water, sewer and transit related services combine to create a complex network of public utilities both above and below ground. Above ground public utilities physically and visually congest the streetscape and take away valuable amenity space, while below ground public utilities interfere with tree planting.

Intensification areas will host greater population density than currently exists in Vaughan. The additional density will place a greater demand for space in the right-of-way for pedestrians, cyclists and vehicular traffic and greater demand and stress on the public utility network from adjacent land uses. The public utility network will need to add additional capacity to accommodate development which will require more space in the streetscape. In the interest of high quality urban pedestrian environments, it is recommended that public utilities be located underground as much as possible in intensification areas.



Municipal Standards

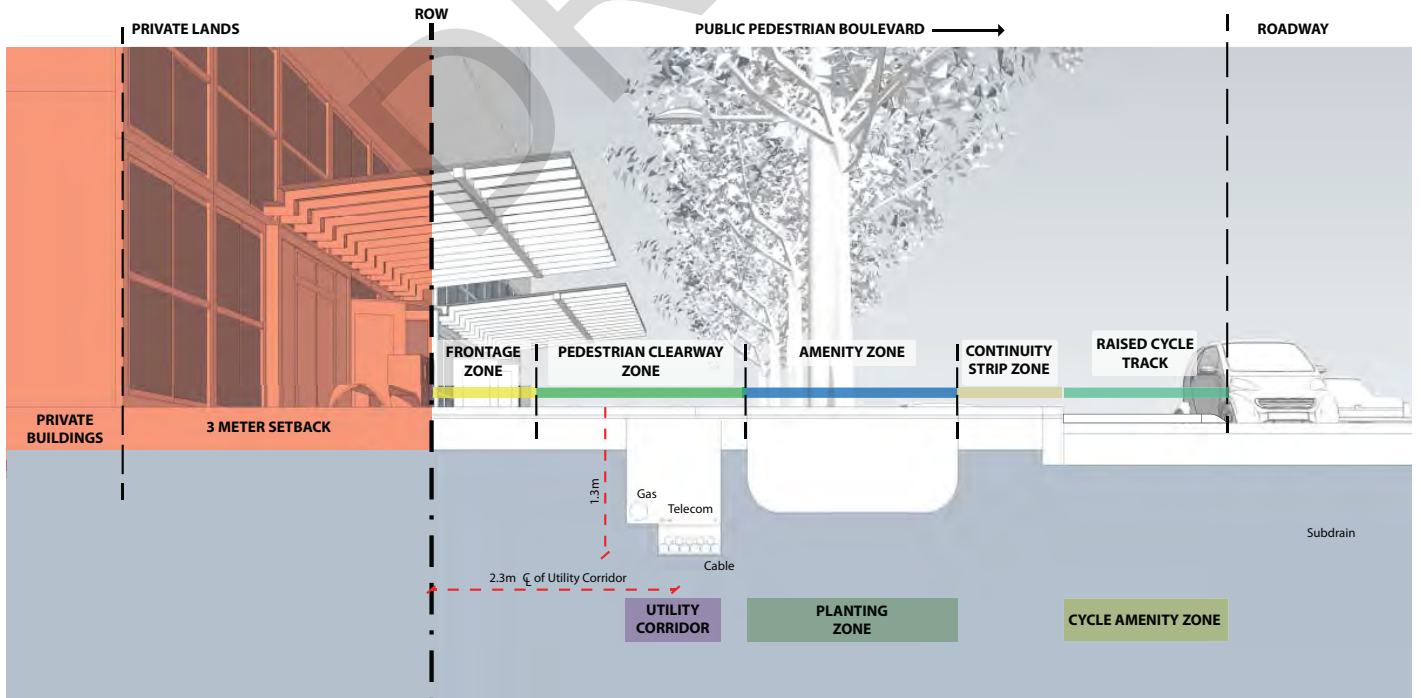
Municipal standards are applied to municipal roads such as minor arterials, major collectors, minor collectors, special collectors, local roads and mews. The Vaughan Engineering Standards indicates the use of a single utility corridor for public utilities. The shared utility corridor is ideal to minimize conflicts with street tree roots found in the amenity / planting zone. However, the stacking nature of the public utilities can potentially create service interruptions to access and maintain unrelated services below. It is recommended that hydroelectricity on municipal roads be buried below ground in Intensification Areas and Heritage Conservation Districts as opposed to above ground power poles which take space in the amenity zone and are not human scale. Underground utility placement should be coordinated with street trees and street lights early in project process to limit conflicts. It is important to note that street trees are considered of equal importance as utilities. Coordination should refer to the Vaughan Engineering Standards.



Vaughan Municipal Utility Placement Standard

Raised Cycle Tracks

Where raised cycle tracks are considered part of the pedestrian boulevard, the raised cycle track shall be non-encumbered, having no public services located below the cycle track where feasible. Coordination should refer to the Vaughan Engineering Standards.



Raised Cycle Tracks in the Boulevard should be Unencumbered

Public Utility Considerations

SERVICES

Electrical Power

While it is preferred that electric power lines be located below grade, the reality is that they will be located above ground on regional roads in intensification areas. Typically, electric power poles will be wood poles standing approximately 24 m – 27 m in height and located approximately 1.0 – 1.5 m from the curb line in the amenity zone. The electrical lines shall be located as high as possible to minimize their visual impact.

Agreements on connections for power to private development will be made with private land owners and may be overhead or below ground depending on the scale of the development.

Gas

Natural gas mains are the public utility typically located nearest to private property. Under the municipal standards, the gas main should be located in the utility corridor which may cross underneath the frontage zone or pedestrian clearway zone. For ease of maintenance, this location is ideal.

Communications

Communication public utilities include telecom and CATV. Owned by private companies, there are various providers with different requirements. These public utilities are typically found under the pedestrian boulevard within a utility corridor for ease of maintenance access. Access hatches and man holes will be required periodically for maintenance.

Water

Where water services are located under the pedestrian boulevard, care must be taken to ensure they are located under the continuity strip zone to avoid conflict and damage from street tree roots in the amenity zone / planting zone. In cases where a raised cycle track is provided as part of the boulevard, water services shall not be placed below the raised cycle track.

Sanitary and storm sewers are typically located under the vehicular roadway and measured from the road centre line according to municipal standards.

Transformers

Transformers shall be located on private lands by means of an enclosed electrical service room as part of future building development or as a separate transformer building / walled compound. Convenient access for maintenance by electrical services staff is to be provided. Transformer housings should be designed in a consistent manner to the architectural character of the development. Alternatively, high quality visual screening in the form of walls, metal screens or other approved screening devices may be used.



ADDITIONAL CONSIDERATIONS

Operations and Maintenance

There are occasions where the operations and maintenance of public utility infrastructure require the pedestrian boulevard to be excavated for access. Locating the utilities in a consistent manner relative to the streetscape zones allows for smaller areas of excavation and thus reduced maintenance costs. Consistent locations also reduce the dangers of damage to different utilities and unforeseen complications.

During excavation to access the public utility infrastructure, surface and paving materials are removed from the pedestrian boulevard. In some cases, the excavation means that the surface or paving materials require replacement. The use of unit paving materials minimizes replacement costs during public utility maintenance. The original boulevard unit paving can be removed and properly reinstalled to maintain the character while reducing the cost of replacement. Poured in place concrete must be broken leading to new concrete being poured to fix the surface treatment.

Operations and maintenance of public utility infrastructure can also cause disruption in the streetscape. When public utilities are located below the frontage and pedestrian clearway zone, maintenance requires the area to be hoarded off for pedestrian safety. This leads to disruption of pedestrian traffic and business of adjacent land uses. Careful utility coordination and communication with adjacent land owners helps to minimize the impact of the disruptions.

Street Trees

The unpredictable nature of tree root growth gives rise to concern of conflicts between street tree roots and below grade public utilities. Street tree roots can potentially damage public utility infrastructure and make it harder to access public utilities if the roots wrap around the services. On the other hand, public utilities can interfere with street tree root growth and cause a deterioration of tree health. Public utilities below grade must be located away from the amenity zone, and in particular, away from the planting zone below trees to minimize these conflicts. Street trees are considered a streetscape infrastructure element of equal importance to utilities and should therefore be coordinated early in the planning process with utilities and illumination elements.

Strata Parking

Careful coordination between public utilities and strata parking agreements must be undertaken in order to minimize conflicts. For example, the high water table in the Vaughan Metropolitan Centre gives rise to possible strata agreements between private developers and the City. The strata agreements would potentially allow for private parking facilities to be located below the public right-of-way. Therefore, careful coordination must be done to ensure there is acceptable space between below grade public utilities and strata parking structures in addition to adequate depths for public utilities below the surface. Careful design must also be considered where public water services are near strata parking structures in the event of pipe malfunction.

Organization and Coordination

It is recommended that organization and coordination of public utilities and services be coordinated formally in the future by a Public Utilities Coordinating Committee (PUCC). The greater demands and population density in Vaughan will require a higher complexity of public utilities. A committee will be able to map, regulate and coordinate the growing development of public utilities to ensure timely service.

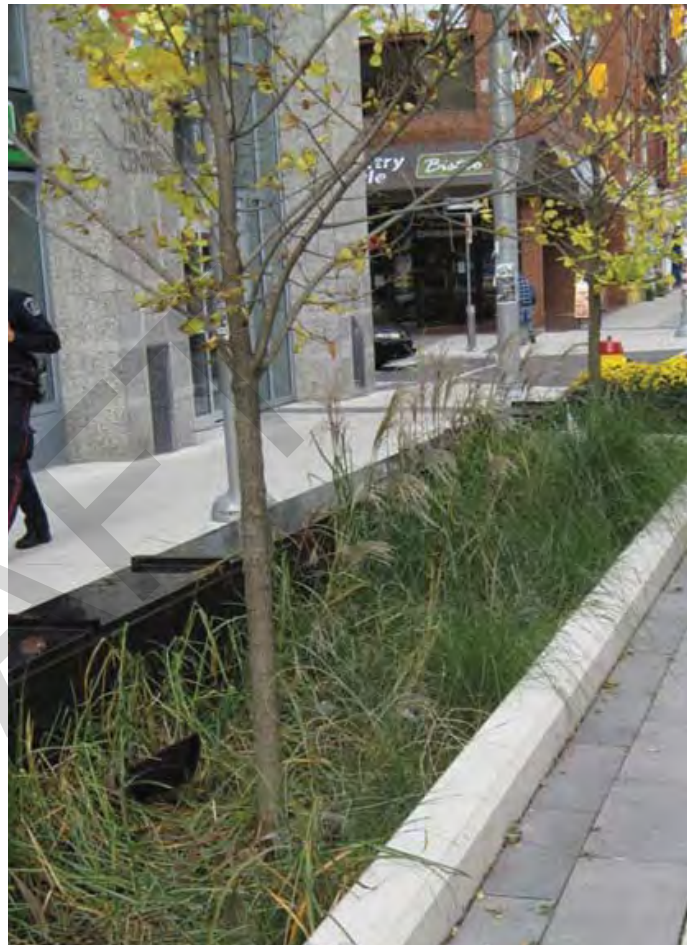
Innovation

The intention of innovation components is to encourage innovative development of streetscapes. Innovation components can be pilot projects to test new streetscape infrastructure including low impact development measures. Typically found in the amenity zone, but not limited to it, innovation components are meant to be unique and contribute to a memorable pedestrian experience. Innovation components are meant to be cultural inspirations and contribute to neighbourhood character. Innovation components also represent ideal situations for educational activities and interpretive signage.

Due to the unique nature of innovation components, special design considerations and coordination is required to ensure successful implementation on the streetscape.

The two potential innovation components discussed in the Vaughan City-Wide Streetscape Implementation Manual include:

- Low impact development measures
- Public art



Low Impact Development Measures

Philosophy and Approach

Low impact development (LID) measures can form part of the streetscape infrastructure while providing multiple benefits to pedestrians and the environment including mitigation of the urban heat island effect, reduction of energy demands, reduction of stormwater flows, protection from flooding, sequestration of carbon, filtration of air and water pollutants as well as a range of aesthetic improvements, pedestrian comfort, social, community and economic benefits. By incorporating LID measures into the streetscape, the streetscape becomes a natural element in the local ecology and reduces the impact its development has on the natural environment.

Incorporated into the Design

LID measures should not simply be applied after the fact to a streetscape's design, the streetscape should have LID measures incorporated during the design process. For this reason several typical LID measures have been included into the streetscape component list. However, it is recognized that LID measures and sustainability are still relatively new and dynamic with regards to implementation in the construction field. New LID measures will have varying degrees of inter-connectivity with adjacent buildings, land uses and public services, etc. Therefore it is important to remain flexible and adaptable regarding LID measures. Designers are encouraged to not only consider storm water management in the traditional sense but also in conjunction with other sustainability objectives.

Live Work Play

The Vaughan City-Wide Streetscape Implementation Manual encourages the live, work, play concept. While normally applied to neighbourhoods, the streetscape is an important part of the live, work, play philosophy. Streetscapes are large networks of public space and should be treated as extensions of residential, retail, commercial and recreational land uses. Streetscapes should encourage individuals to walk and lead healthy and active lifestyles and therefore must cater to pedestrian needs.

The Vaughan City-Wide Streetscape Implementation Manual also encourages the use of other criteria and performance measures which affect the design of streetscapes and low impact development including:

- Sustainable Sites Initiative
- LEED for Neighbourhood Development

The following criteria and performance measures should be considered in conjunction with low impact development measures for streetscape design.



Sustainable Sites Initiative (SITES)

It is important to encourage the collaboration of natural and built systems to improve the long-term health of the environment and of socially and economically viable communities. The American Society of Landscape Architects Sustainable Sites Initiative (2009) has established criteria, which is intended to compliment the U.S. Green Building Council's LEED-ND Rating System, to facilitate such collaboration. It is the intent of the criteria to help transform traditional land development and management practises toward more sustainable methods. The criteria are as follows:

Site Selection Considerations

- Protection of floodplains by restricting development from the 100-year floodplain of waterways
- Restricting development from wetland areas
- Protection of habitats belonging to threatened or endangered species
- Brownfield or greyfield redevelopment as opposed to greenfield development
- Reduce pollution and improving human health by designing accessible sites for pedestrians, cyclists and locating near public transit

Pre-Design Assessment and Planning Considerations

- Site assessment to explore site sustainability opportunities
- Integrated site development process
- Meaningful public engagement process to inform site design

Water Considerations

- Reduction of potable water, natural surface water and groundwater for landscape irrigation after plant establishment
- Use of water conservation strategies and other irrigation methods
- Protect and restore riparian, wetland and shoreline buffers
- Restoration and maintenance of site water balance
- Integration of rainwater / storm water features into the site design which provide aesthetic and physical amenities while providing water management functions

- Conservation of water by designing and maintaining water features integrated into the landscape with minimal or no make-up water from potable sources or other natural surface or subsurface water resources

Soil and Vegetation Considerations

- Implementation of management plans to control known invasive plants found on site to limit their damage to local ecosystems
- Improve landscape performance and reduce resource use by using appropriate plants such as non-invasive species
- Use of appropriate vegetation native to the site eco-region
- Preservation and restoration of native plant communities
- Define location and boundaries of vegetation and soil protection zones through the use of a soil management plan prior to construction to limit disturbance and assist in soil restoration efforts.
- Preservation and identification of special status designated vegetation by local, provincial and federal governments
- Restoration and preservation of appropriate plant biomass on site
- Reduce building heating and cooling requirements by strategically planting vegetation around buildings
- Reduction of the heat island effect by use of vegetation and reflective materials

Human Health and Well-Being Considerations

- Promotion of equitable site development and use
- Influence of habitual user behavior through education and interpretation of on-site sustainability features and processes
- Enhance a sense of place and meaning by protecting unique cultural and historical features
- Design for safety, ease of wayfinding and full accessibility
- Provide amenity space to accommodate physical activity to promote active and healthy lifestyles
- Incorporate space for quiet mental restoration with views to vegetation and calming features
- Provide community building and social amenity

Sustainable Sites Initiative (SITES)

space through gathering spaces of various sizes and orientations

- Minimize light pollution by reducing sky-glow, increasing nighttime visibility and minimize negative effects on nocturnal environments and human health and functioning

Materials Selection Considerations

- Preserve threatened tree species by using alternative wood species
- Conservation of resources and avoid landfill waste by using salvaged materials and plants
- Support socially and environmentally responsible forest management by using certified wood
- Use locally sourced materials, plants and soils
- Reduce air pollution through the use of low VOC (volatile organic compounds) paints, sealants, adhesives and coatings
- Support manufacturers using sustainable practices in plant production and material manufacturing

Construction Considerations

- Protection of water, air quality and public safety by preventing or minimizing the discharge of construction site pollutants and materials
- Use of disturbed soils during construction in areas to be re-vegetated
- Divert construction and demolition materials bound for disposal in landfills from site development to recycling whenever possible
- Manage construction and design to achieve a net-zero waste site by reusing and recycling vegetation, rocks and soil generated during construction
- Limit greenhouse gas emission and air pollutant generation during construction

Operations and Maintenance Considerations

- Achieve maintenance goals with a site maintenance plan through long-term strategies and short term actions
- Facilitate recycling and reduce water generation by providing storage and collection space for recyclables
- Organic matter from site operations and maintenance to be recycled

- Minimize outdoor energy consumption for landscape and exterior operations
- Reduce greenhouse gas emissions and minimize air pollution by using renewable sources for landscape electricity needs
- Minimize greenhouse gas emissions and exposure to localized air pollutants from landscape maintenance activities
- Provisions for preferred parking for reduced emissions, high-fuel efficiency and / or carpools to reduce emissions

Monitoring and Innovation Considerations

- Improve the body of knowledge of long-term site sustainability by monitoring and documenting sustainable design practices and evaluate their performance over time
- Reward innovative sustainable practices which exhibit exceptional performance in all aspects of site design



LEED for Neighbourhood Development

Working in conjunction with the Sustainable Sites Initiative (SITES), it is important to consider criteria found in the LEED 2009 for Neighbourhood Development (LEED-ND). The LEED-ND places a strong emphasis on site selection, design and construction elements to integrate building and infrastructure design together. While the rating system of LEED-ND is generally applied to new neighbourhoods, the criteria are still useful as a tool to set the performance levels of streetscape infrastructure.

Therefore, adapted from the U.S. Green Building Council's LEED 2009 for Neighborhood Development Rating System, updated May 2011, the following performance criteria is intended to guide healthy, durable, affordable and environmentally sound practices for streetscape design. The criteria are as follows:

Smart Location and Linkage

- Promote active transit, public transit usage and reduce personal vehicular trips to improve and redevelop existing communities
- Use locations with multi-modal choices to promote development and reduce personal vehicular usage, reduce greenhouse gas emissions and air pollution
- Provide bicycle infrastructure such as a bicycle network, bike parking and storage to promote utilitarian active transportation habits and support the public health benefits
- Support the live, work, play concept by encouraging a diversity of uses for balanced communities
- Protect and restore native plants, wildlife habitat, wetlands and water bodies

Neighbourhood Pattern and Design

- Provide safe, appealing and comfortable streetscape environments to support public health and safety through encouraging daily physical activity
- By prescribing compact development, promote livability, walkability and transportation efficiency
- Promote the development of communities with a high degree of internal connectivity
- Create walkable streetscapes which have buildings and activities close to the street, limit building facades which do not have activation or are blank along the streetscape, ensure ground level retail is visible at night, provide on-street parking, limit driveway entrances through the streetscape and promote continuous sidewalks on both sides of the street
- Facilitate walking, cycling and public transit use by clustering diverse land uses in mixed-use accessible neighbourhood centres
- Design for a diversity of housing types, affordable housing options and mixed-income communities to promote socially equitable and engaging communities
- Minimize the environmental effects of parking facilities by moving off street surface parking to the rear or side of buildings to increase the amount of building and streetscape connection.
- Promote active transit and public transit use with safe, convenient and comfortable transit waiting areas, and secure bicycle storage facilities
- Provide easily accessible public open space near employment and residential land uses to improve social capacity, physical and mental health
- Improve physical activity and social networking through the provision of a variety of recreational facilities close to employment and residential land uses
- Enhance accessibility with the universal design of all streetscape elements
- Promote health and nutrition with access to community-based food production and local farmer support
- Reduce the heat island effect and improved air quality by providing tree lined streets with shade which encourages walking, cycling and public transit use

Green Infrastructure and Building

- Promote the use of green building practices in design and construction of streetscapes
- Design and construct innovated streetscapes which reduce air, water and land pollution and adverse environmental effects from energy production and consumption
- Reduce dependency on the community fresh water supply and wastewater systems with streetscape infrastructure which deals with storm and building water efficiency
- Reduce construction activity pollution by controlling soil erosion, waterway sedimentation and airborne dust generation
- Limit or eliminate the use of potable water and other natural surface or subsurface water resources for landscape irrigation
- Preserve historic resources and cultural landscapes in a manner that preserves historic materials and character-defining features.
- Preserve existing non-invasive trees, native plants and pervious surfaces.
- Retain stormwater on site, through infiltration, evapotranspiration and / or reuse.
- By using materials with a Solar Reflectance Index (SRI) of at least 29, pervious pavement (at least 50%) and designing a street tree canopy reduce the heat island effect of the streetscape
- Encourage on-site renewable energy production to reduce adverse environmental and economic impacts associated with fossil fuel production and use.
- Design for energy efficient infrastructure to reduce energy consumption with traffic lights, streetlights etc.
- Design infrastructure elements with recycled and reclaimed materials (roadways, parking lots, sidewalks, unit paving etc.)
- Minimize light pollution by reducing sky-glow, increasing nighttime visibility and minimize negative effects on nocturnal environments and human health and functioning

Innovation and Design Process

- Foster continued innovation and exemplary performance in green building, smart growth and new urbanism that is not found in the LEED for Neighbourhood Development Rating System.
- Promote strategies to address issues of social equity, public health and geographically specific environments



Public Art

The inclusion of public art within the right-of-way of public streets presents numerous technical challenges. The right-of-way zone contains many below grade and above grade services, requires unobstructed access for repairs and maintenance, unobstructed access for snow removal services and is subject to restrictions for sight lines of vehicles. Due to these technical requirements, as well as the lack of available space within this zone, the range of forms of public art is somewhat limited.

With these limitations in mind, the following discussion of potential opportunities is intended as a means of implementing public art into streetscapes in recognition of these technical requirements.



Public Art on Private Land

Opportunities

Public Spaces

In light of the restrictions of locating public art in the public right-of-way, focus should be placed on the most publicly accessible areas of the streetscape as well as on adjacent public spaces such as roadway and pedestrian route intersections within the designated “amenity zone”.

Where possible, public art should be included within and adjacent to public transit stops, especially at highly visible intersections. As well, where possible, public artworks projects should be scheduled to coincide with planned capital improvement and repair projects such that efficiencies in funding, through leveraging of total capital budgets, can be recognized. Artwork budgets should be applied to existing budgets for design elements such that the “delta” of the art budget can be maximized.

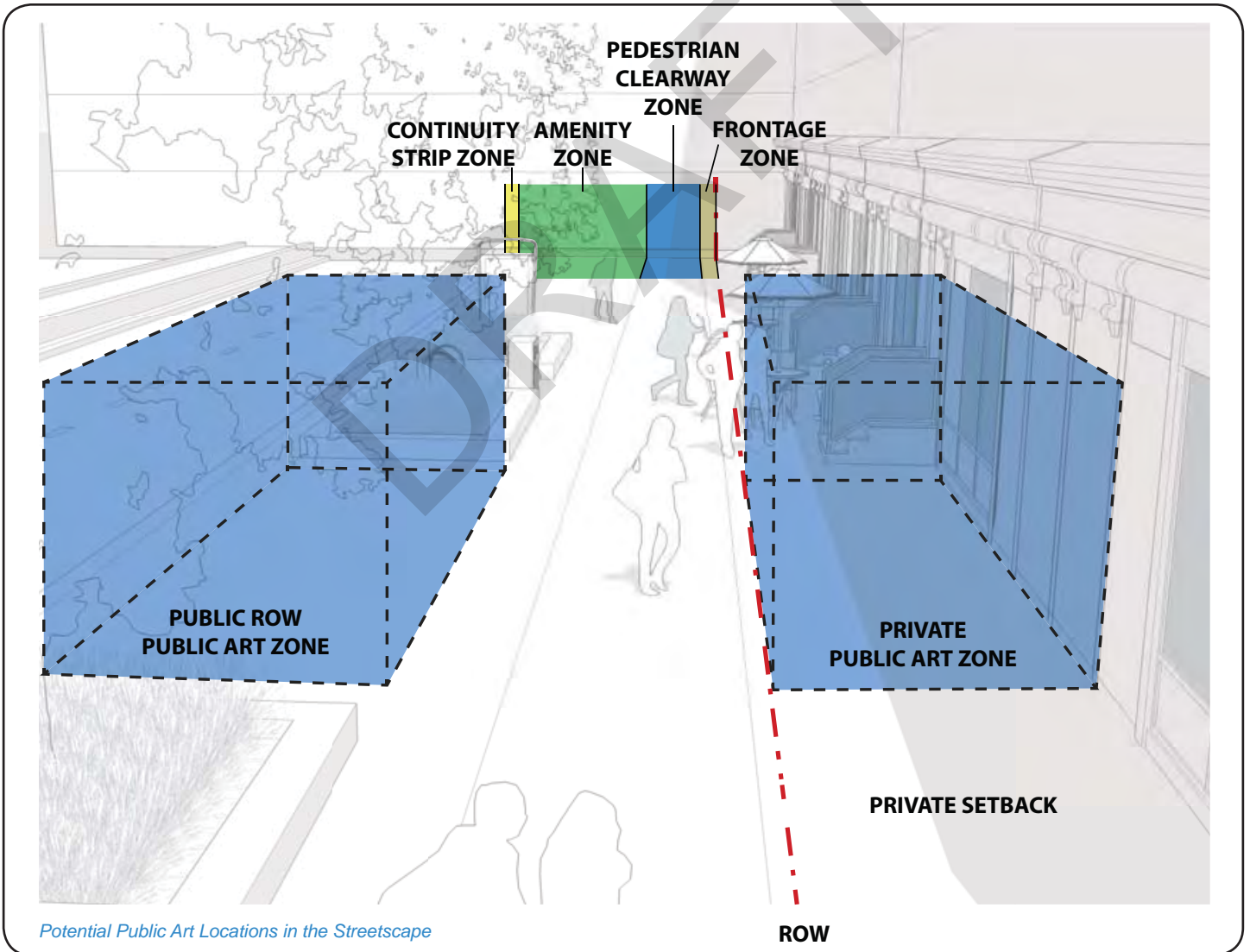
Ideally, artists should be included as members of design teams on capital improvement and infrastructure construction projects such that opportunities can be identified and exploited, including the design of standardized elements within the public right of way and streetscape feature lighting (coloured lighting).

Public spaces adjacent to public right-of-ways are opportunities for the inclusion of public art. Given the alleviation of some of the technical restrictions in these spaces, public art expression can have greater breadth.

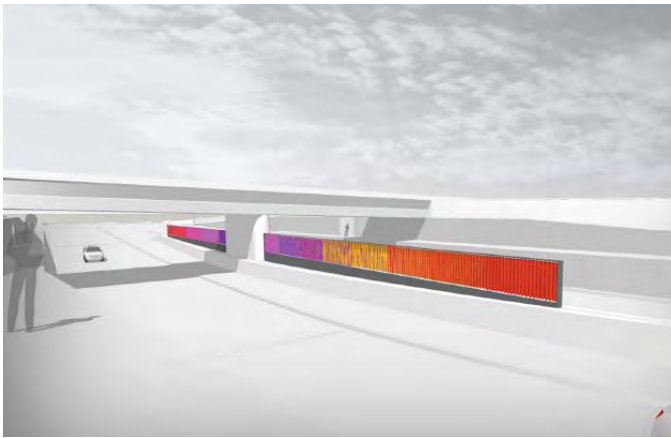


Private Spaces

Inclusion of public art in public streetscapes adjacent to private development, should be encouraged in public art policy. Where possible, allowance should be made for the inclusion of public art in the public right-of-way such that artworks on private development can find additional footprint for implementation. Multi-component public artworks which sit on private land, with elements situated on adjacent public lands provide opportunity for greater breadth of artistic expression.



Potential Public Art Locations in the Streetscape



Artist: Paul Raff Studio
 An example of a public artwork (proposal) that engages the median space along a public transitway. The artwork is highly visible to pedestrians, public transit users as well as vehicles.



Artist: Jason Bruges Studio
 An example of a public artwork, with minimal footprint, that works at the scale of public infrastructure and is legible to vehicular traffic.



Artist: Jun Kaneko
 Park Avenue, in New York City, through a privately controlled programme, manages exhibits in the median space of the roadway. This is an example of an ongoing, temporary display of public art within the median of a public roadway allowance.



Artist: Pipilloti Rist
 An example of a public artwork, located on private property, adjacent to a public right-of-way that engages the experience of users of the right-of-way.



Artist: Karl Ciesluk
 An example of how public artwork can be implemented in the streetscape right-of-way, within the stringent technical requirements of this zone.



Artist: Brad Golden and Norman Richards
 An example a public artwork whose implementation was scheduled to take advantage of existing plans for capital improvements to the public sidewalk.



Design: Robert Maschke Architects
 An example a streetscape element designed as a component of an artist-led streetscape improvement programme that included seating, planting and paving.

Kit-of-Parts for Urban Intensification Areas

	Continuity Strip	Pedestrian Clearway	Frontage Zone	Seating	Bicycle Parking	Waste Receptacles	Pedestrian Lighting
Basic							
Standard Urban							
Enhanced							
Premium							

Accent Lighting

Street Tree Planting

Ornamental Planting

Custom Tree Grates/ Guards

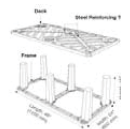
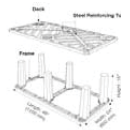
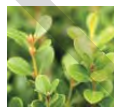
Planters / Planting Islands

Street Media

Custom Branding / Wayfinding

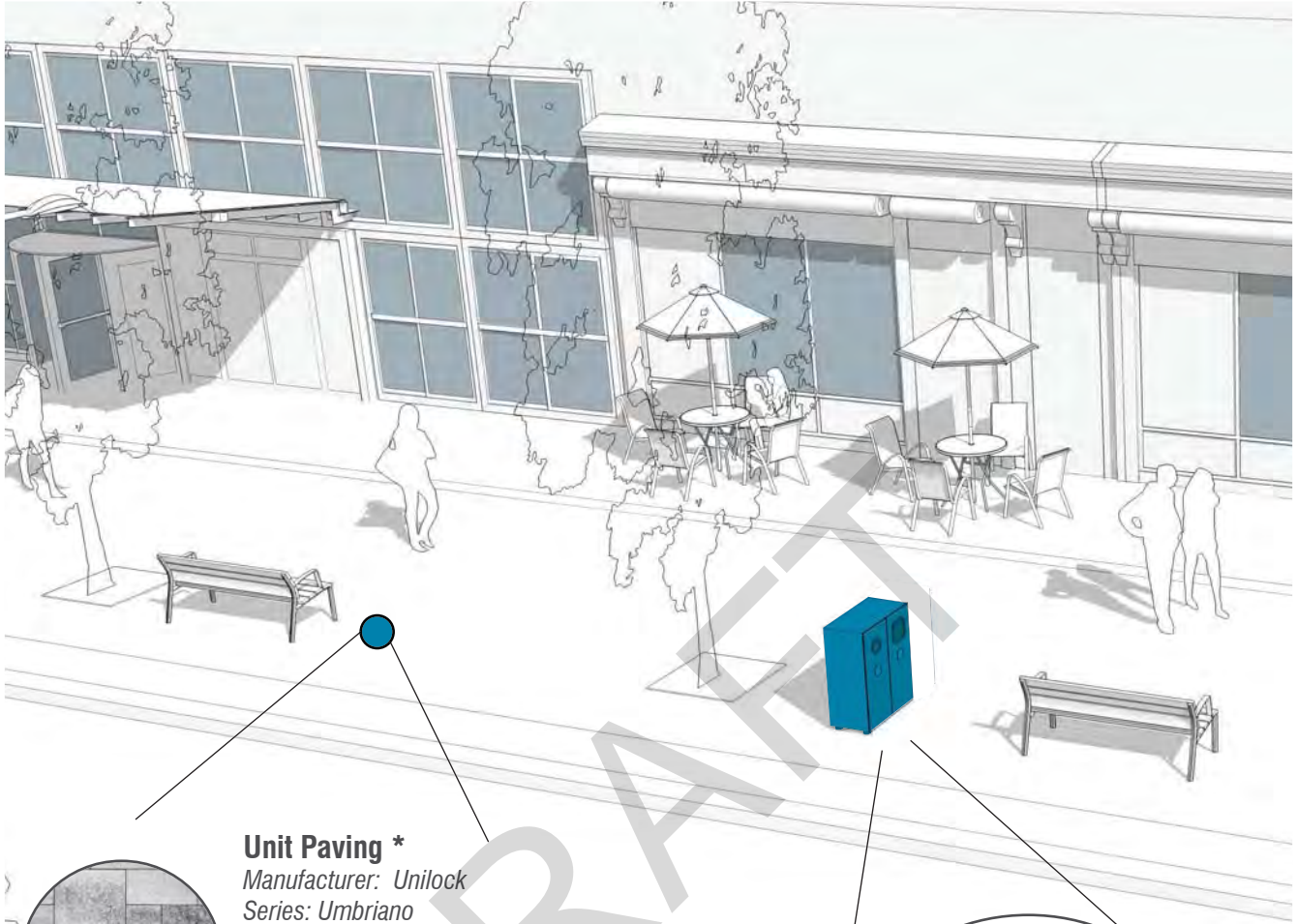
L.I.D. Measures

Structural Soil Cells



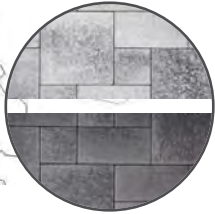
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Enhanced and Premium Defaults



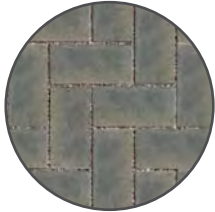
Unit Paving *

Manufacturer: Unilock
 Series: Umbriano
 Colour: Winter Marvel (Field)
 Midnight Sky (Accent)
 (or other complementary colour)
 Feature: Non-bevelled top edge
 Base: Concrete



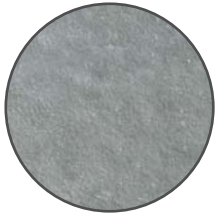
Permeable Paving *

Manufacturer: Unilock
 Series: Eco-Priora
 Colour: Santa Fe
 (or other complementary colour)



Natural Stone *

Manufacturer: Unilock
 Series: Natural Stone
 Colour: Hearthstone
 (or other complementary colour)
 Base: Concrete



Pattern: Large Format Plank Style

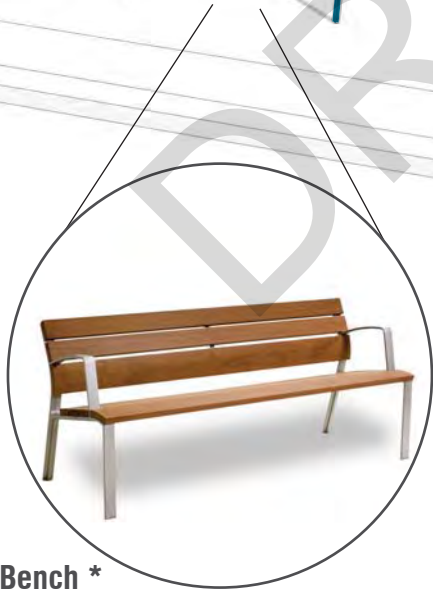
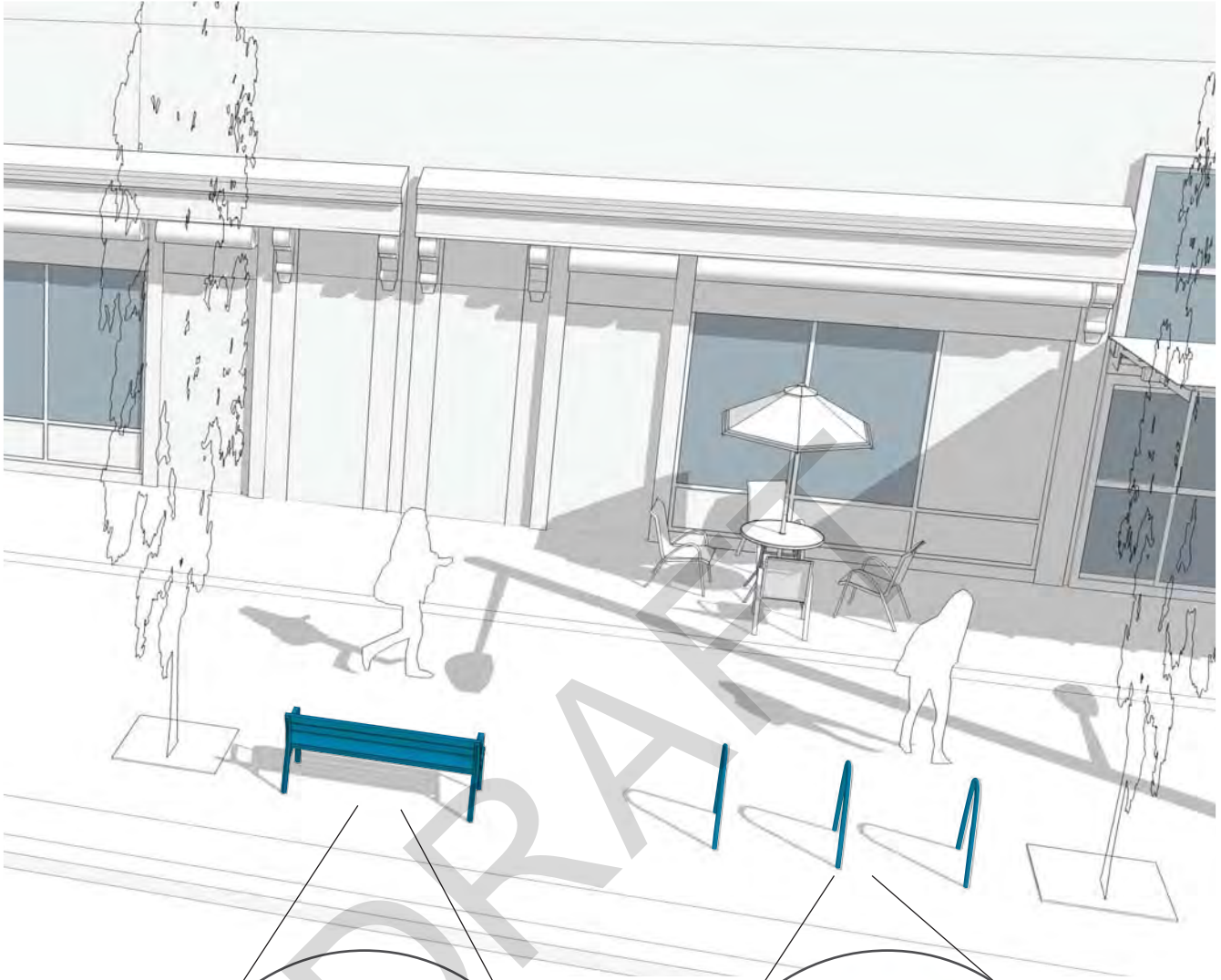
* Or Approved Alternative

Waste Receptacles *

Manufacturer: Landscape Forms
 Style: Select Letter Receptacle
 (double unit, solid body, perforated doors)
 Material: Powdercoated Metal
 Colour: Silver (body, door),
 Black (trim ring, signage plate)



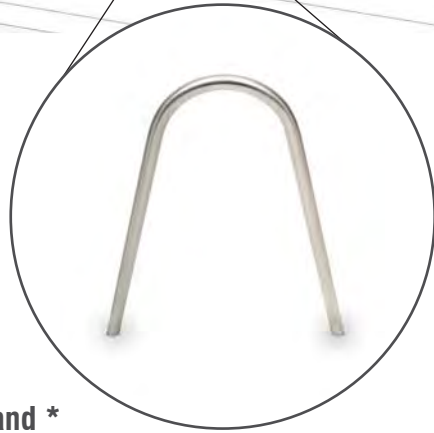
* Or Approved Alternative



Streetscape Bench *

*Manufacturer: Landscape Forms
 Style: Neoliviano
 Material: Metal / Wood
 Colour: Aluminum Finish /
 Jarah Wood*

** Or Approved Alternative*



Bicycle Stand *

*Manufacturer: Landscape Forms
 Style: Bola
 Material: Embedded Powder Coat
 Colour: Stainless Steel*

** Or Approved Alternative*

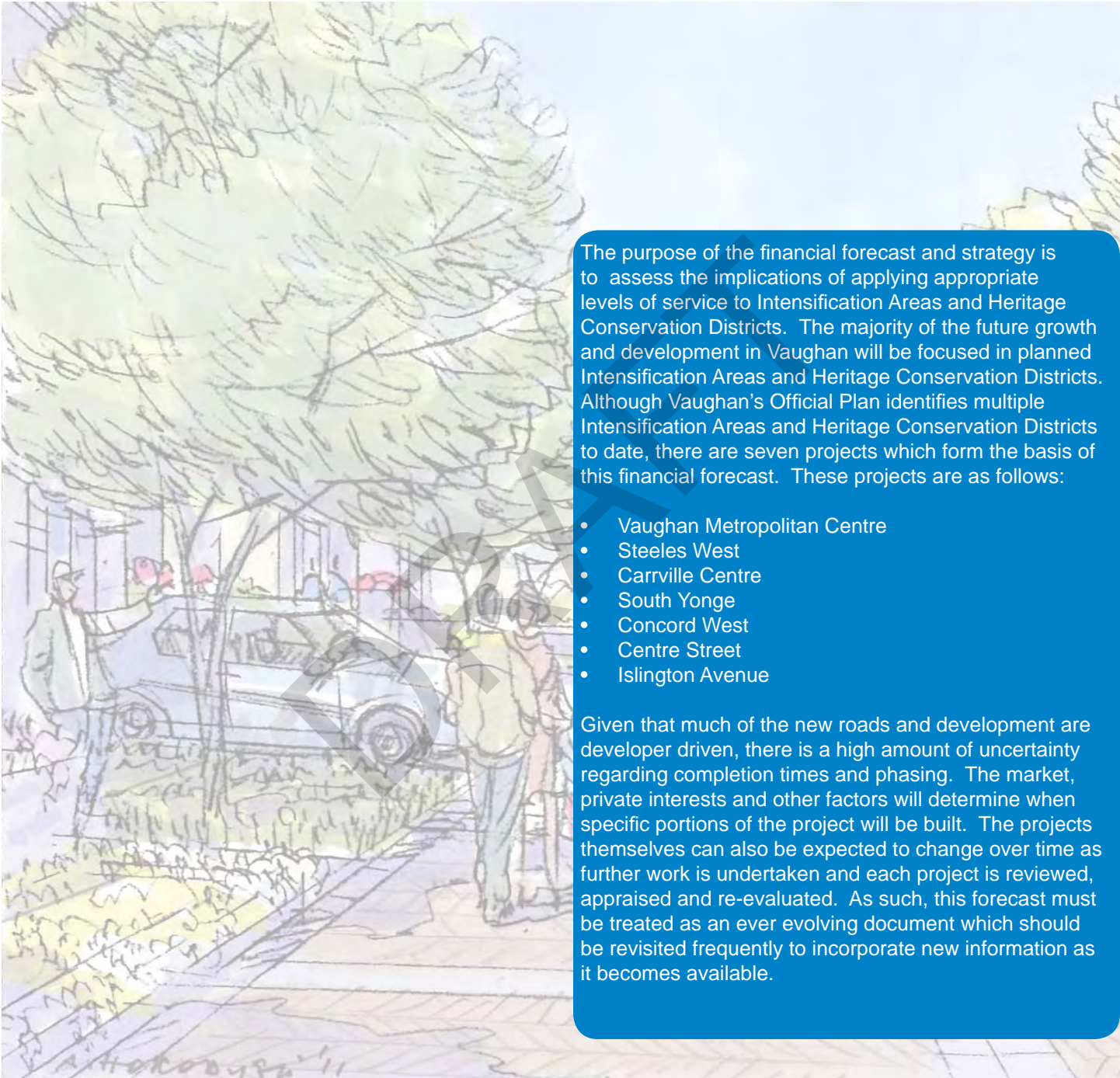
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IMPLEMENTATION

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The purpose of the financial forecast and strategy is to assess the implications of applying appropriate levels of service to Intensification Areas and Heritage Conservation Districts. The majority of the future growth and development in Vaughan will be focused in planned Intensification Areas and Heritage Conservation Districts. Although Vaughan's Official Plan identifies multiple Intensification Areas and Heritage Conservation Districts to date, there are seven projects which form the basis of this financial forecast. These projects are as follows:

- Vaughan Metropolitan Centre
- Steeles West
- Carrville Centre
- South Yonge
- Concord West
- Centre Street
- Islington Avenue

Given that much of the new roads and development are developer driven, there is a high amount of uncertainty regarding completion times and phasing. The market, private interests and other factors will determine when specific portions of the project will be built. The projects themselves can also be expected to change over time as further work is undertaken and each project is reviewed, appraised and re-evaluated. As such, this forecast must be treated as an ever evolving document which should be revisited frequently to incorporate new information as it becomes available.

It is important to understand the context of which the levels of service and intensification projects will impact the City’s future financial commitments. The very point of the Vaughan City-Wide Streetscape Manual is to service the forecasted future growth in Vaughan. As indicated in the 2013 City of Vaughan Development Charges Background Study, the residential population is forecasted to grow from 288,301 in 2011 to 400,871 as of 2031. Employment is also forecasted to grow from 188,640 as of 2011 to 266,098 as of 2031. The growth in population and employment means two things for Vaughan in relation to streetscape development: an increased tax base and focused and efficient streetscape investment.

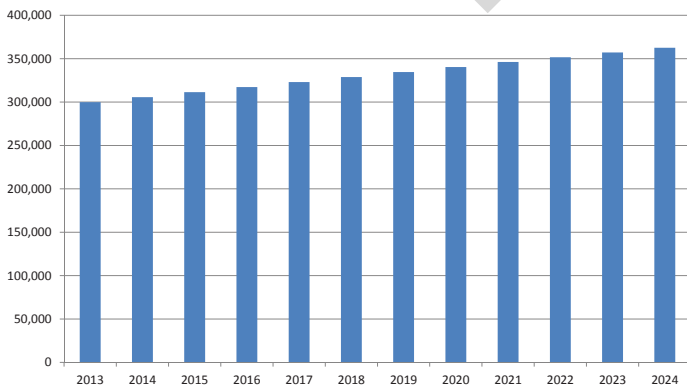
Increased Tax Base

First, the increase in capital and operations and maintenance costs for streetscapes is in relation to an increased tax base. While costs for higher levels of service streetscapes may seem daunting in the current financial outlook, the current financial outlook is not what the future streetscapes will be supported by. The growth of population and employment will increase Vaughan’s financial resources alongside the increase in streetscape commitments. Therefore it is important to not judge the increase in costs solely on the current financial situation.

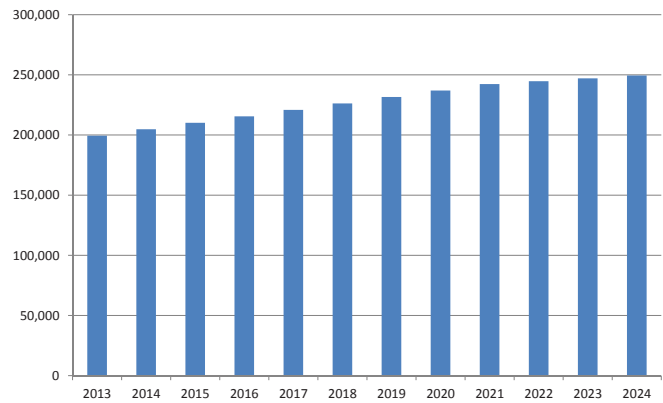
Focused and Efficient

Growth is expected to be concentrated in the intensification project areas. The concentration of intensification means that the delivery of high quality streetscapes is efficiently focused in relatively small areas while serving a larger dense population. For example, upon full build-out, the intensification projects in total will represent approximately 8% of Vaughan’s overall linear meters of streetscape. Furthermore, approximately 5 - 6% of Vaughan’s overall linear meters of streetscape will be of the Standard Urban level of service. The Enhanced level of service will be approximately 2 - 3% of Vaughan’s overall linear meters of streetscape and the Premium level of service will represent approximately 0.25%. Therefore, while the per linear meter cost increase of the levels of service may seem high, the costs will be applied efficiently to a relatively small area in Vaughan’s overall streetscape system and will maximize its impact.

As there are other intensification projects yet to be included, the financial forecast and strategy will change and evolve as streetscape master plans are added.



Residential Population Forecast
(According to the 2013 Vaughan Development Chart Study)



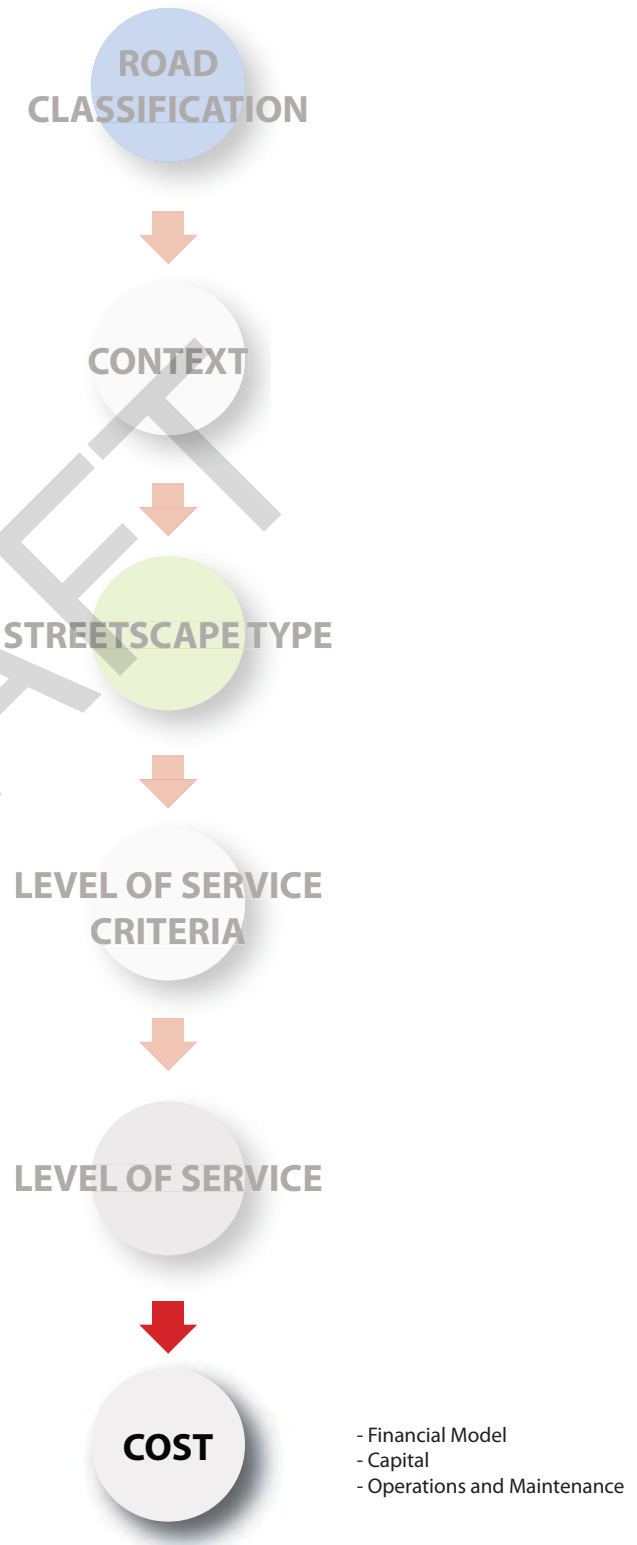
Employment Population Forecast
(According to the 2013 Vaughan Development Chart Study)

City Process

As introduced in Section 1, the last stage in the City Process, the cost stage, follows after determining the level of service of streetscapes. The cost step is important at this stage of the planning process as it informs Council on the potential future financial commitments to the City and guides decision makers on potential next steps.

This section of the Vaughan City-Wide Streetscape Implementation Manual deals with the financial strategy and cost implications of the levels of service and their financial impact on the City. To determine the financial impact, a financial model was created. The model takes into account funding sources, capital cost, operations and maintenance costs and phasing.

All other stages of the City Process provide information as inputs into the financial model. The inputs provide a basis for the model to make decisions on what funding is available and distribution.



The Model

Premise

The rationale for creating the streetscape financial model was to create more certainty around assumptions which are used in current decision making regarding urban streetscape master plan projects. The essential aim is to provide a usable framework of financial measures, layered onto design inputs for specific projects to address questions regarding:

- **Appropriate Level of Service**
- **Capital Cost**
- **Funding by Source**
- **Phasing**
- **Operating Costs**
- **Capital Reserve Requirements in Relation to Overall Life Cycle Considerations of each Level of Service**

The outputs of the model are intended to aid decision-making by applying a standardized set of assumptions regarding the above elements so that individual projects can be compared on a like for like basis, and the collective impacts of projects can be assessed in terms of their likely capital and operating funding requirements.

Key Funding Sources

The model assumes the following order of draw on available funding sources:

- 1) Development Charges (DC)** - subject to the existing cap on capital cost development charge eligibility as contained in the latest DC Background Study.
- 2) Developer contribution** - based on 100% contribution to the cost of new local roads and a lower likelihood of contribution by developers for streetscape required in relation to newly developed areas/parcels. Given the relative uncertainty of this funding source other than for local roads, the model provides for several scenarios of likelihood and differentiates this likelihood by road hierarchy.
- 3) Regional Municipality of York Funding** - for those projects identified by the Region as potentially coinciding with planned regional road infrastructure work (at a rate of 50%) and further, a lower rate of one third funding (33%) for projects which are located on regional roads but which do not have regional road infrastructure work planned.

- 4) Taxation Funding** – the remaining costs for capital development are assumed to be funded from the tax base.

The approach to funding is conservative and the model utilizes percentages of contribution which account for the risk attached to obtaining funding from these sources in the future. The funding approach specifically excludes any reliance on grant funding from other levels of government (whether Gas Tax or other funding sources) as these are considered infrequent and unpredictable as it pertains to any given streetscape capital project.

Depreciation and Life Cycle

The model has developed a specific series of assumptions for life cycle – applied to each level of service:

- **Standard Urban: 20 years**
- **Enhanced: 35 years**
- **Premium: 50 years**

The initial work on the model created a functional life span for each material and component contained in the palette of materials. However, the fundamental premise of this model (of necessity as a replicable financial tool) is that the level of service represents the key driver of financial impacts. Accordingly, a process was undertaken whereby the overall life cycle duration of each level of service was arrived at and utilized in the model.

The model therefore includes estimates of depreciation. It is important to note that the model does not include repeat capital costs – i.e. replacement of street components. Only the depreciation value is provided which should then be used to determine when, under normal circumstances, capital replacement should occur.

Capital reserve contributions are set as 5% of original capital cost (unescalated). This is shown in the model as a separate item and is also combined with operating costs to demonstrate the outlay for operations and reserve needed in each year going forward.

In addition to separating out capital liability to the City (taxation base), operating liability and capital reserve requirements, the model outputs identify the total annual cost (capital, operating and reserve) for which the taxation base is liable.

Model Framework

The financial model was created as an excel model designed to take various inputs of information typically known in a streetscape master plan and engineer outputs of cost. The model and financial forecast works upon the inputs of three different sources:

- Master Plan Project Inputs
- Phasing Project Inputs
- Cost Inputs

Master Plan Project Inputs

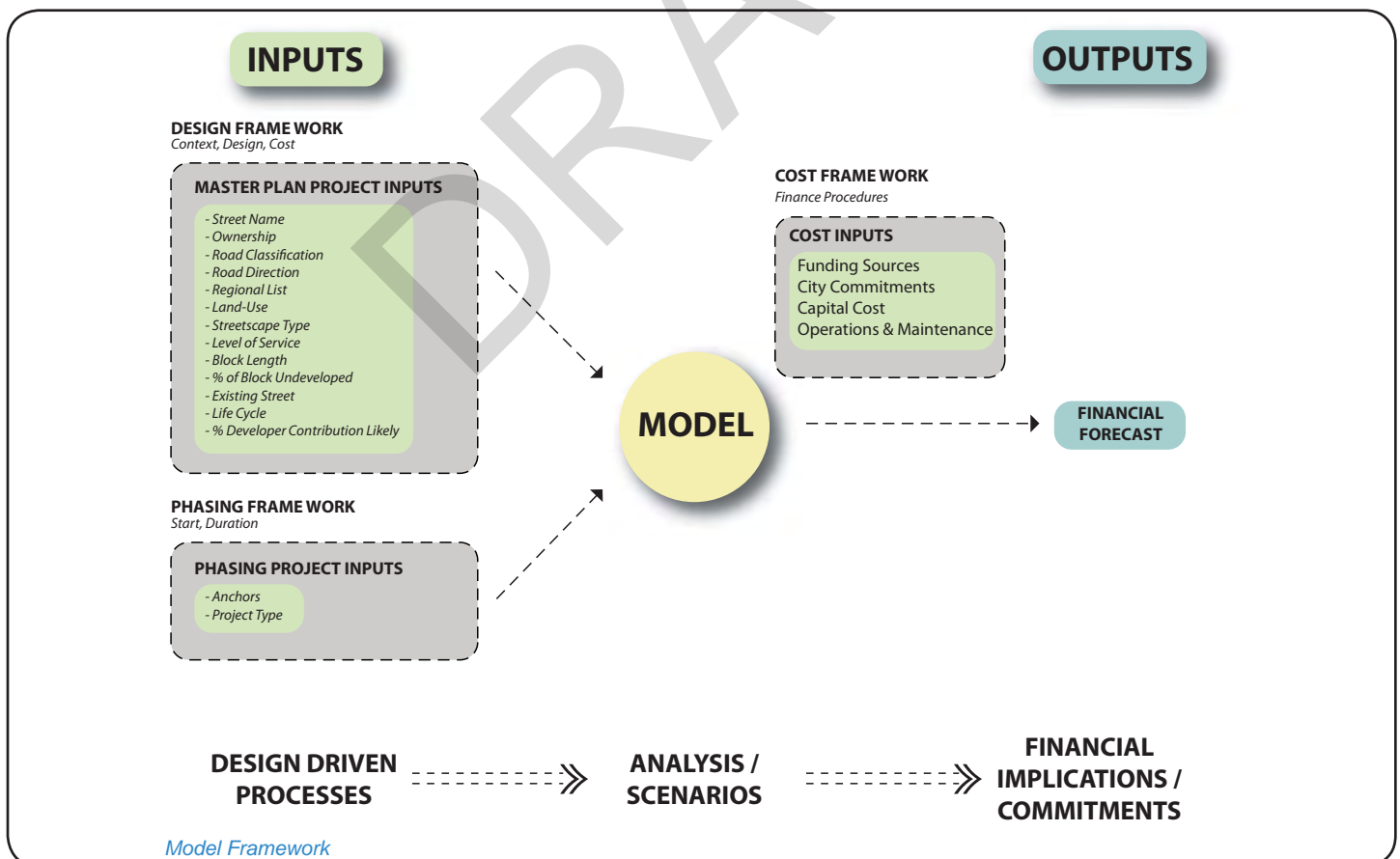
Master plan inputs are information found in the master plans of Intensification Areas and Heritage Conservation Districts. They combine elements of context, design and cost. These inputs also contribute to the level of service of the streetscape and provide an understanding of what is being costed and built.

Phasing Project Inputs

Phasing project inputs are information that is included in the master plan but also from other external sources. Phasing project inputs are elements of when the project may start and its duration. This type of information go beyond the master plan and start to consider matters of implementation and coordination with other projects. Funding sources may also be considered with these inputs if there are time dependant factors.

Cost Inputs

Cost inputs are information derived from City financial procedures. How potential funding is distributed and how future financial commitments are calculated is programmed directly into the model so City Process users do not have to input this information. The cost inputs are information dependant upon the master plan project and phasing project inputs.



Level of Service and the Model

The level of service concept is important to the design and financial strategy as a bonding element between design and cost. As discussed in Section 4, the levels of service consider the context of an area, the resulting design solution and cost. The importance of the level of service concept to the model is the component of cost, both capital and operations and maintenance, which allows design to be reflected in the financial model.

To be used in the model, the level of service concept was simplified into the level of service prototypes explained in Section 4:

- Standard Urban
- Enhanced
- Premium

Capital Costs

For the prototype levels of service to be relevant and tied to cost, all the potential streetscape components were identified and assigned a typical cost. Component costs were identified from the Vaughan's Development Charge studies, Vaughan staff, and consultant team experience. Once all components and costs were agreed upon, each of the level of service prototypes was designed per the streetscape structure, found in Section 3, and to encompass typical elements found in the relevant level of service. The components available per their level of service were chosen from the Streetscape Component Selection Matrix (see Appendix G), and were then costed according to the Streetscape Component Breakdown Chart (see Appendix G). This ensured that each level of service prototype is a construction of the detailed aggregate of design.

Capital construction costs have an addition of 20% for soft costs typically applied in construction costing. While inflation in the model has been set to 0%, it is possible to add inflation to the outputs through the model.

Operations and Maintenance Costs

Each level of service prototype was also assigned an operations and maintenance cost. As with the capital cost, the operations and maintenance cost was determined at the aggregate level based upon the design components. The design components and how they are used in the structure of the pedestrian boulevard determined what operations and maintenance activities would occur. With confirmation with City of Vaughan staff, operations and maintenance activities were assigned to each level of service prototype based upon the design.

Infrastructure Reserve Calculation

The infrastructure reserve calculation is a separate calculation in the model. It is recognized that funding gaps exist in the currently budgeted operations and maintenance activities, specifically with hardscaped streetscapes. Therefore, the reserve calculation was inflated from the current reserve policy in an attempt to address the funding gaps. It is recommended that the current reserve policy be revisited.

Pedestrian Corner Treatments and Bicycle Infrastructure

Bicycle infrastructure is mostly considered part of the roadway infrastructure and therefore were not included in the model costing. Pedestrian crosswalks were not included in the model costing. However, pedestrian corner treatments were factored into the level of service.

Capital costs and operations and maintenance costs are expressed as per linear meter unit costs to allow for calculations in the model and applied to the master plan projects. The following pages outline the recommended capital and operations and maintenance assumptions for each level of service prototype.

**Basic Level of Service
Capital / Operating and Maintenance**

CAPITAL **\$514.85 / lm**

Amenity Zone

- Trees and Planters
 - Tree Deciduous 60mm Caliper
 - Planting Soil
 - Compacted Mulch
- Softscape
 - Sod

Pedestrian Clearway Zone

- Main Field
 - Poured In Place Concrete

Frontage Zone

- Softscape
 - Sod
 - Planting Bed

Illumination Elements

- Standard
 - Street Lighting

OPERATING AND MAINTENANCE **\$14.72 / lm / yr**

Continuity Strip Zone

- Spring Cleanup
 - Salt Strip Sweeping

Amenity Zone

- Street Trees
 - Pruning
 - Mulching and Fertilization
 - Basic Root Pruning
- Softscape
 - Lawn Mowing

Pedestrian Clearway Zone

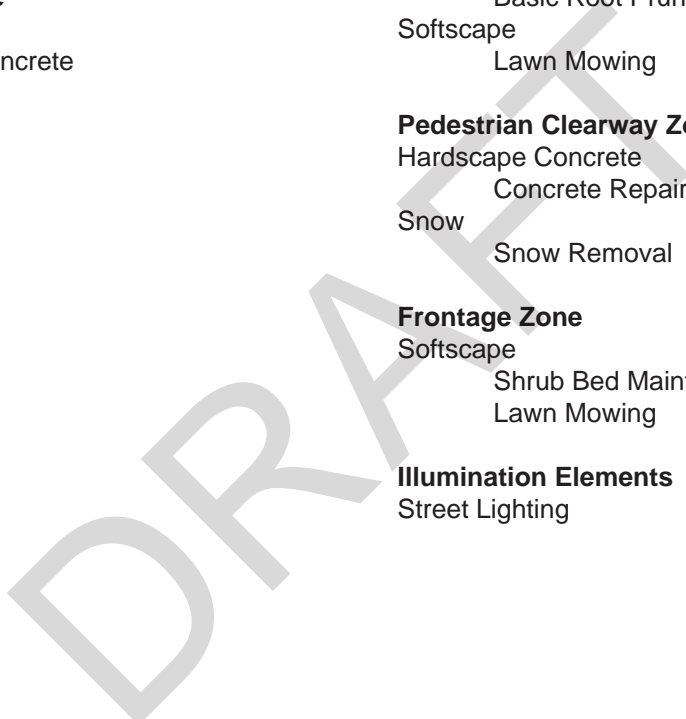
- Hardscape Concrete
 - Concrete Repairs
- Snow
 - Snow Removal

Frontage Zone

- Softscape
 - Shrub Bed Maintenance
 - Lawn Mowing

Illumination Elements

- Street Lighting



**Standard Urban Level of Service
Capital / Operating and Maintenance**

CAPITAL *\$974.25 / lm*

Continuity Strip Zone

- Hardscape
 - Poured In Place Concrete

Amenity Zone

- Hardscape
 - Poured In Place Concrete
- Trees and Planters
 - Tree Deciduous 60mm Caliper
 - Planting Soil
 - Raised Planter Curb
 - Perennials and Ornamental Grasses

Pedestrian Clearway Zone

- Main Field
 - Poured In Place Concrete

Illumination Elements

- Standard
 - Street Lighting

OPERATING AND MAINTENANCE *\$99.70 / lm / yr*

Continuity Strip Zone

- Hardscape
 - Concrete Repairs
- Spring Cleanup
 - Salt Strip Sweeping
- Snow
 - Snow Removal

Amenity Zone

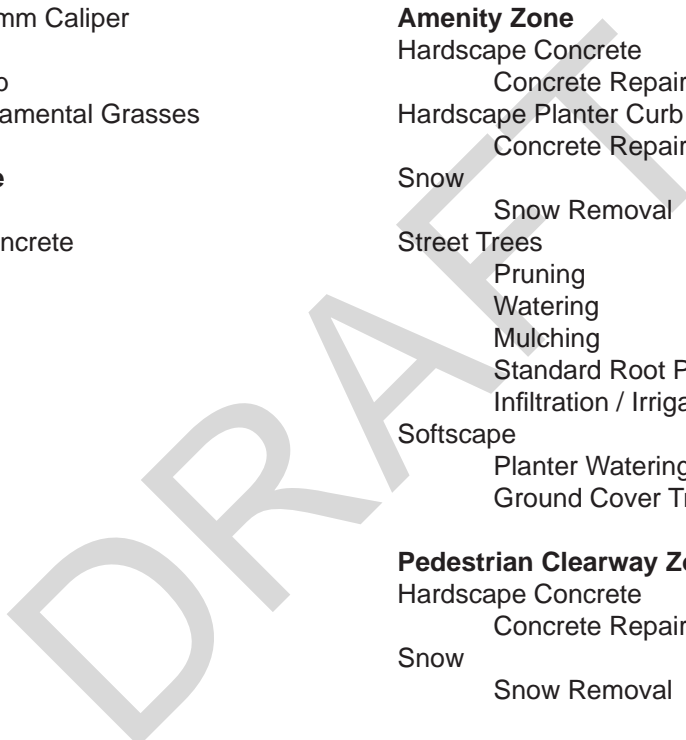
- Hardscape Concrete
 - Concrete Repairs
- Hardscape Planter Curb
 - Concrete Repairs
- Snow
 - Snow Removal
- Street Trees
 - Pruning
 - Watering
 - Mulching
 - Standard Root Pruning
 - Infiltration / Irrigation / Flushing
- Softscape
 - Planter Watering / Maintenance
 - Ground Cover Trash Removal / Maintenance

Pedestrian Clearway Zone

- Hardscape Concrete
 - Concrete Repairs
- Snow
 - Snow Removal

Illumination Elements

- Street Lighting



**Enhanced Level of Service
Capital / Operating and Maintenance**

CAPITAL **\$2,919.98 / lm**

Continuity Strip Zone

- Hardscape
 - Poured In Place Concrete

Amenity Zone

- Hardscape
 - Pre-Cast Concrete Unit Pavers on Concrete Base

Trees and Planters

- Tree Deciduous 80mm Caliper
- Raised Planter Curb
- Planting Soil
- Perennials and Ornamental Grasses
- Soil Cells

Furniture

- Bench
- Trash Receptacle
- Bicycle Stand
- Branding Signage

Pedestrian Clearway Zone

- Main Field
 - Poured In Place Concrete

Frontage Zone

- Hardscape
 - Poured In Place Concrete

Illumination Elements

- Pedestrian Lighting
- Street and Pedestrian Lighting

OPERATING AND MAINTENANCE **\$152.28 / lm / yr**

Continuity Strip Zone

- Hardscape
 - Concrete Repairs
- Spring Cleanup
 - Salt Strip Sweeping
- Snow
 - Snow Removal

Amenity Zone

- Hardscape Unit Paving
 - Unit Paver Repairs
 - Concrete Base
- Hardscape Planter Curb
 - Concrete Planter Repairs
- Snow
 - Snow Removal
- Street Trees
 - Pruning
 - Watering
 - Mulching and Fertilization
 - Infiltration / Irrigation / Flushing
- Softscape
 - Planter Watering / Maintenance
 - Ground Cover Trash Removal / Maintenance
 - Trash Receptacle

Pedestrian Clearway Zone

- Hardscape Concrete
 - Concrete Repairs
- Snow
 - Snow Removal

Frontage Zone

- Hardscape Concrete
 - Concrete Repairs

Illumination Elements

- Typical Lighting
 - Pedestrian Lighting
 - Street / Pedestrian Combo Lighting

**Premium Level of Service
Capital / Operating and Maintenance**

CAPITAL **\$3,389.50/ lm**

Continuity Strip Zone

- Hardscape
 - Poured In Place Concrete

Amenity Zone

- Hardscape
 - Poured in Place Concrete
 - Natural Stone
- Trees and Planters
 - Tree Deciduous 100mm Caliper
 - Raised Planter Curb
 - Planting Soil
 - Perennials and Ornamental Grasses
 - Soil Cells

Furniture

- Bench
- Trash Receptacle
- Bicycle Stand
- Branding Signage

Pedestrian Clearway Zone

- Main Field
 - Pre-Cast Concrete Unit Pavers on Concrete Base
- Paving Accent
 - Natural Stone

Frontage Zone

- Hardscape
 - Poured In Place Concrete

Illumination Elements

- Standard
 - Pedestrian Lighting
 - Street and Pedestrian Lighting

OPERATING AND MAINTENANCE **\$167.65 / lm / yr**

Continuity Strip Zone

- Hardscape
 - Concrete Repairs
- Spring Cleanup
 - Salt Strip Sweeping
- Snow
 - Snow Removal

Amenity Zone

- Hardscape Unit Paving
 - Unit Paver Repairs
 - Concrete Base
- Hardscape Planter Curb
 - Concrete Planter Repairs
- Snow
 - Snow Removal
- Street Trees
 - Pruning
 - Watering
 - Mulching and Fertilization
 - Infiltration / Irrigation / Flushing

Softscape

- Trash Receptacle

Pedestrian Clearway Zone

- Hardscape Unit Paving (Main Field)
 - Unit Paver Repairs
 - Concrete Base
- Hardscape Unit Paving (Accent Field)
 - Unit Paver Repairs
 - Concrete Base

Snow

- Snow Removal

Frontage Zone

- Hardscape Concrete
 - Concrete Repairs

Illumination Elements

- Typical Lighting
 - Pedestrian Lighting
 - Street / Pedestrian Combo Lighting

Master Plan Inputs

For each intensification project, a separate financial model was created. The outputs of all the intensification project models were then compiled together to create the financial forecast.

The financial model works upon the basis of a block by block level of detail. This meant that information from the master plan needed to be understood and was inputted into the model by the street, block and block side. This level of detail ensured that the level of service can accurately respond to the needs of a streetscape. Given that streetscapes generally remain unified along the full length of a block, and transitions created at intersections, the per block level of detail was considered effective. To input the model information, a key plan was created for each intensification project to indicate the street, block side and block number. Inputs for the design framework are detailed below.

Street Name

The street name, in conjunction with the block number and block side, identifies the location of the streetscape treatments. It is important to have accurate identifiers to justify the level of service applied to the streetscape responding to the master plan design.

Ownership

Ownership of a street deals with jurisdiction and can affect funding. City of Vaughan streets are the responsibility of the City and potentially developers with regards to capital costs. Regional streets may have access to funding and streets partially owned by bordering municipalities are opportunities for partnerships in cost sharing. However, the bulk of streetscapes are City-owned streets.

Road Classification

The road classification determines the streetscape's place in the overall street network and hierarchy. Major arterial streets are exclusively regionally owned streets. Road classification also gives indications of the street function and its character regarding volumes of vehicular traffic. The streetscape type needs to respond to these conditions.

Road Direction

The road direction refers to the orientation of the main cardinal direction of the street. The financial model works at a block level of detail and therefore the

identification of which block along a streetscape and which side is important to know. The road direction helps to identify which block side the information pertains to. For example, a north-south street will have blocks with east and west identifiers. This information is used in conjunction with the street name and number of blocks.

Regional List

Potential regional funding is affected by the York Region Municipal Streetscape Partnership Program (MSPP). The funding percentage that York Region will contribute is affected by successful application and if a streetscape can be found to coincide with regional street infrastructure projects.

Number of Blocks

The number of blocks along a streetscape is used with the street name and road direction to identify locations of streetscape treatments. The number of blocks along a street is automatically broken down with the street name and block side so that inputs of land-use, streetscape type, level of service, block length, and percentage of block undeveloped can be accurately applied to the master plan design.

Land-Use

The adjacent land-use along a block indicates the uses that the streetscape design must respond to. This information is important to decide the streetscape type and how the streetscape design will respond to the adjacent uses. The adjacent land-use gives a sense of the character of the street based upon the type of pedestrian activity.

Streetscape Type

The streetscape type is a design response to the adjacent land-use. The streetscape type gives a sense of the physical character of the street based upon design responding to pedestrian activity.

Level of Service

The level of service is one of the most important inputs in the model. The level of service chosen for a block of streetscape determines the linear meter cost and what components and materials are available for detailed design. The level of service takes the elements of context, design and cost and allows the model to take those elements into account when formulating a future financial impact.

Block Length

The block length of a street is needed to determine the cost of a streetscape. Each block length along a streetscape in the project must be known to apply the per linear meter level of service costs.

Percentage of Block Undeveloped

The percentage of block undeveloped input refers to how much of a block is undeveloped or requires redevelopment to align with the new master plan streetscape block structure. How much undeveloped land is available along a block affects developer contributions to the new or upgraded streetscape. The more undeveloped land along a streetscape block the greater the developer contributions.

Existing Street

Existing streets have an existing operations and maintenance value associated with the street. If a street is indicated as existing, it affects the future operations and maintenance values since operations and maintenance were likely occurring prior to the streetscape upgrade.

Life Cycle

The life cycle of a streetscape is an automatic model input / output based upon the level of service. The life cycle is based upon the typical life cycles of components found in each level of service and the expected life cycle of a streetscape of that quality. While Standard Urban streets are basic streetscapes, Enhanced streetscapes are intended to have a character that will not change over at least a generation. Premium streetscapes should be memorable and designed to be “timeless”. Standard Urban levels of service are expected to have an approximately life cycle of 20 years, while Enhanced and Premium life cycles will have an approximate life cycle of 35 and 50 years respectively.

Percentage Developer Contribution Likely

The percentage of developer contribution likely is an automatic input / output based upon the road classification. Along major arterials (regional roads) the Region has the potential to contribute 33 to 50% of funding through the MSPP. The developer is not likely to contribute the full remaining 50% and therefore the assumption of 25% was made. On local roads, developers are expected to contribute 100% of funding through their developments. On other municipal roads, it is possible that developers could contribute up from 75 to 100% of the streetscape funding, however it was felt a safer assumption would be 50%.

Phasing Inputs

Phasing inputs in the model are different from master plan inputs in that they may deal with external factors not found in the master plan. There is a great deal of uncertainty with phasing inputs and many assumptions may be made during the process. Never-the-less, phasing inputs are important as model inputs as they have an impact on the potential funding sources and future financial commitments.

It is useful to think about phasing in the form of overall project phasing and specific project phasing. Overall project phasing is discussed as part of the financial strategy and accounts for the phasing of multiple intensification projects in relation to each other and deals with project start dates, project durations and potential funding sources. Specific project phasing makes assumptions and considerations of construction phasing of specific intensification projects. When a specific street will be constructed in relation to another street in an intensification project affects the financial forecast on a year to year basis with greater detail than just knowing the overall project duration. Operations and maintenance costs are affected by the phasing of specific streets.

The following phasing inputs are found in the model and are affected by overall project phasing and specific project phasing considerations.

Phasing by Street

As each street is included in the models “project” worksheet it must be assigned a phase. Phasing by street is specific to the individual intensification area project and is mainly related to construction matters. The individual inputting phasing by street information must have knowledge of which streets are important as catalysts for development, which streets will be developed as partnerships with other parties and the planning and construction issues of the particular project.

Year End of First Projected Year

The year end of first projected year input specifies the end of the starting year of the project and is based upon overall project phasing. This input, in conjunction with the first estimated month and year of phase start input determines how many months of construction can be completed in the first year of the intensification project. This is relevant to the start of operations and maintenance costs.

Length of Phase (in months)

Length of phase indicates how long each phase lasts in months. Depending on what streets are included in each phase and the complexity of streetscape construction the lengths of each phase may vary. The length of phase input further divides and details capital construction and operation and maintenance costs.

Estimated Month and Year of Phase Start

The estimated month and year of phase start indicates the start of the construction of each phase in the project. This input may be affected if phases are not continuous allowing for an overlap in phases.

Are Phases Continuous

The are phases continuous input indicates scenarios where street phases overlap. If the phases are continuous there is no overlap and the start and end dates of the phases will show consecutively. However, if any of the phases are not continuous, the start date of the phase may be set to overlap with another phase. Non-continuous phases create implications for capital and operations and maintenance cost commitments.

Financial Strategy

As discussed in Section 2, the financial strategy is a part of the overall City-Wide Strategy along with the design strategy. The design strategy, comprised of the streetscape types and level of service concept, is intended to tie into the financial strategy to bring together design and cost concerns. Connecting the design and financial strategies together is accomplished by combining the levels of service and the financial model.

A large part of the financial strategy is the financial model. The financial strategy and model is a combination of the elements of phasing, funding and design and ensures a holistic approach to streetscape implementation. As discussed earlier, the financial model is also a construct of the City of Vaughan's financial processes for streetscapes taking into account issues such as, but not limited to, capital costs, operation and maintenance costs, infrastructure replacement reserves, development charges, regional funding, developer funding and order of seniority of funding. The outputs of the financial model allow the financial strategy to evolve as new information becomes available. At present, the financial strategy includes seven intensification projects. The level of service concept was applied to these projects and inputted into the model. The model's outputs yielded results that allowed for analysis and subsequent adjustments to the levels of service. As more projects are added, the model outputs will inform how the strategy may be modified. The financial strategy will be discussed per the elements of:

Phasing

- Anchors
- Project Type

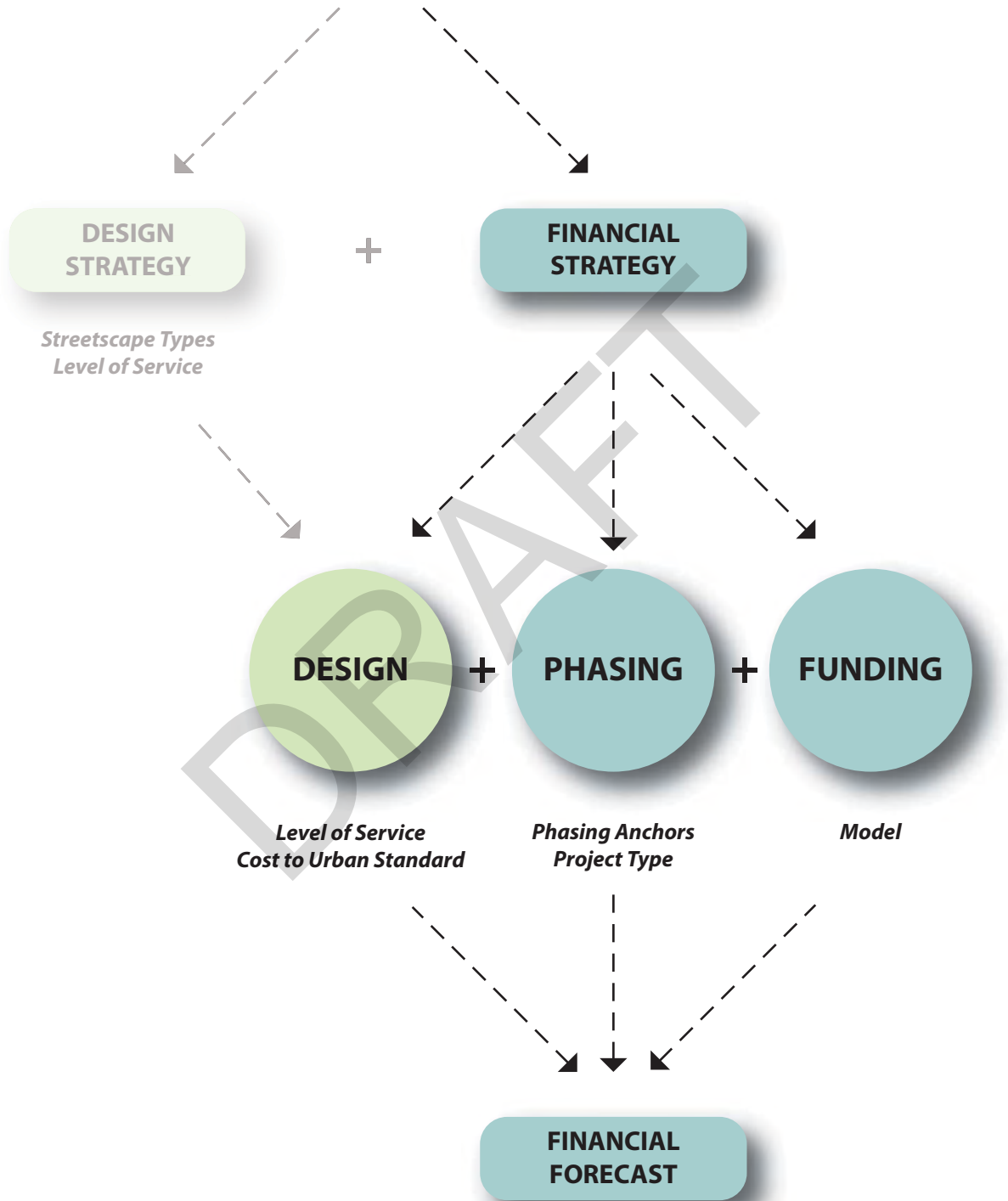
Funding

- Additional Funding Sources

Design

- Level of Service Distribution
- Level of Service Scenarios

CITYWIDE STRATEGY



Phasing

To ensure that the phasing input assumptions were objective, the phasing assumptions were determined upon the basis of two main factors:

- Anchors
- Project Type

Anchors

A series of existing funding schedules represented anchors by which the City could judge its intended initiation of each project and acted as a basis for a forecast for City expenditure. These anchors only apply to streets part of the existing network and not new streets. These anchors came from sources such as:

- VivaNext
- York Region Municipal Streetscape Partnership Program
- Vaughan Development Charges

These anchors represent existing planned construction in the intensification areas which are related to roadway and public infrastructure. By aligning streetscape intensification projects with these infrastructure projects, the City can take advantage of funding from these sources, ensure minimal disruption to traffic and businesses and make efficient use of timing and resources.

Anchors:

Development Charges Streetscape Specific Funding

The latest City of Vaughan Development Charge Background Study (2013) provides the project phasing for each relevant project under the Development Charge (DC) over the period from 2013-2022 and beyond to 2028. In relation to the seven intensification projects in the financial forecast, the funding schedule is shown graphically on the adjacent page.

Development charges funding is largely dependent upon streetscape enhancements coinciding with the engineering infrastructure construction making ideal anchors to start project construction.

Anchors:

VivaNext and York Region MSPP

An agreement between Vaughan and VivaNext outlines the upgrading of streetscapes along VivaNext's bus rapid transit network. Streetscape upgrades will occur according to a VivaNext schedule which is a reasonable time for other streetscape project work to occur.

The York Region MSPP program is another potential source of timing and funding. As with the other sources, York Region anticipates doing streetscape infrastructure work at various times in the future. In conjunction with this work, it offers a program in which the City can apply for additional funding along regional roads where the Region is doing infrastructure work.

Development Charges Streetscape Specific Funding

PROJECT	YEARS														15			20			25		
	10 YEAR TIME FRAME																						
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2028	2029	2033	2033	2038	2033	2038					
Corridor (2 yrs)	Islington																						
Catalyst (10 yrs)	Concord West																						
	Centre Street																						
	Yonge Street																						
Generational (+20 yrs)	Carrville Centre																						
	Steeles West																						
	Vaughan Metropolitan Centre																						

VIVA and Regional Funding Availability

PROJECT	CONSTRAINT	YEARS														15			20			25		
		10 YEAR TIME FRAME																						
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2028	2029	2033	2033	2038							
Corridor (2 yrs)	Islington																							
Catalyst (10 yrs)	Concord West																							
	Centre Street																							
	Yonge Street																							
Generational (+20 yrs)	Carrville Centre																							
	Steeles West																							
	Vaughan Metropolitan Centre																							

Project Type

The project type largely determines the duration of the project but can also indicate when initiation is desirable. There are three project types:

- [Generational Projects](#)
- [Catalyst Projects](#)
- [Corridor Projects](#)

The projects types were developed around the consideration of certainty and priority.

Certainty

The project certainty is mainly determined by how much control a municipality has over the projects full build out. The full build out of large projects with a large amount of new local roads and undeveloped private lands are determined largely by developers. Developer interests and market influence when new development, and therefore new local roads, will be built. The greater concentration of undeveloped private developer lands means the municipality will have little control over the project construction. Collector roads offer more certainty since they can be built by the municipality regardless of development. The project's size and complexity also affect the certainty of the projects development.

Generally, projects with low certainty tend to have longer durations, while projects with high certainty have shorter durations.

Priority

The project priority is determined by its importance and intent. Projects which are intended to be catalysts or that which include catalysts for development should have priority for construction. In large projects with a large amount of undeveloped private lands, it is important to construct the catalyst early in the process to encourage development and reduce the project duration. Catalysts for development include a major cultural node, urban centre, mobility hub, transit hub, regional urban square etc.

Small projects with municipal control that can be finished easily have high priority for completion since they have a good certainty of completion.

Generational Projects

Generational projects create new roads and infrastructure while creating new employment and residential lands. Generational projects are ambitious long term projects which last longer than a generation (longer than 25 years) and dramatically change the overall character of an area. A large portion of generational projects are new local roads fronting undeveloped private lands meaning there is little municipal control over when development will occur. Generational projects have the a great amount of uncertainty and need a strong catalyst to encourage development. The construction of the catalyst portion of generational projects is a priority.

The generational projects include:

- [Vaughan Metropolitan Centre](#)
- [Steeles West](#)
- [Carrville Centre](#)

Characteristics:

- > 25% new roads
- > 25% undeveloped developer lands
- Mix of new roads and existing road enhancements
- Little municipal control over full build out and project duration
- Mix of land-uses including medium to high density residential, employment, recreational and retail services
- Project anticipated to be constructed over a + 25 year period
- Project includes development of a major node or urban centre as a catalyst with regional significance (mobility hub, transit hub, cultural centre, institutional centre, regional urban square, etc.)



Catalyst Projects

Catalyst projects are meant to encourage enhancement and infill of adjacent land-uses. Catalyst projects may include a minor amount of new roads or development, but are only moderately dependent upon private development. The catalyst project is mainly an enhancement to existing roads and should be constructed over a 10 year period. Catalyst projects may include small nodes but are not dependant upon their construction. Catalyst projects do not typically have a high priority given their potential costs and may be delayed depending on the likelihood of private redevelopment.

The catalyst projects include:

- Concord West
- Centre Street
- South Yonge

Characteristics:

- < 25% new roads
- < 25% undeveloped developer lands
- Mostly enhancement of existing roads.
- Private development mostly enhancement and infill
- Some municipal control over full build out and project duration
- Project anticipated to be constructed over approximately a 10 year period
- Project may include small nodes (including transit stations and small squares)



Corridor Projects

Corridor projects are generally smaller projects with little complexity which can be completed with a good deal of municipal control. Corridor projects are typically enhancements to existing roads with little anticipation of new development to adjacent lands. Corridor projects typically are completed over no longer than a two year period and do not require the development of a catalyst or node. The relative certainty of project completion, short construction timeline and relatively lower cost make corridor projects ideal to complete early with high priority.

The corridor projects include:

- Islington Avenue

Characteristics:

- Little to no new roads
- Little to no undeveloped developer lands
- Mostly enhancement of existing roads
- Project duration mostly under the control of the Municipality
- Project anticipated to be constructed in approximately a 2 year period
- Project funding to be handled largely as a single investment



Preliminary Project Phasing & Funding Strategy

April 23, 2014

	PROJECT	CATALYST	YEARS																
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 - 2030	2031 - 2036	2037 - 2042	2043 - 2048	
Corridor (2 yrs)	Islington Avenue	NONE																	
	Concord West	VIVA																	
Catalyst (10 yrs)	Centre Street	VIVA																	
	Yonge Street	DC FUNDING																	
Generational (+20 yrs)	Carrville Centre	REGIONAL FUNDING																	
	Steeles West	TTC																	
	Vaughan Metropolitan Centre	VIVA / TTC																	

Consultant Phasing

Knowing the anchors associated with the projects and the project types, the intensification projects were assigned a phasing. For each project, the project type was determined (approximate duration), a potential catalyst was identified and potential anchors by funding sources were considered.

Islington Avenue

Key Points

- Corridor Project (approximately 2 year duration).
- No identifiable catalyst.
- Access to potential DC funding starting in the year 2014.
- Access to potential regional funding pending application and acceptance.

With no catalyst or anchor available, Islington Avenue can potentially start construction at any time. However, the current York Region MSPP is scheduled through 2022. Potentially, this project could be placed on York Region’s schedule in 2023 with access up to 50% funding pending successful negotiations with York Region. Therefore, in the interest of maximum funding, Islington Avenue was phased to potentially start in the year 2023.

Concord West

Key Points

- Catalyst Project (approximately 10 year duration).
- VivaNext construction along Highway 7 represents a catalyst for construction work in the year 2015.
- Access to York Region MSPP 50% funding for Highway 7 and Keele Street.

Construction by VivaNext present the best opportunity to minimize disturbance and maximize resources

for construction and funding. Given the 10 year approximate project duration, phasing the project to coincide with VivaNext construction allows Concord West to partner and coordinate with VivaNext while also access regional funding in the years 2019 and 2020.

Centre Street

Key Points

- Catalyst Project (approximately 10 year duration).
- VivaNext construction along Centre Street represents a catalyst for construction work in the year 2015.
- Access to DC funding starting in the year 2014.
- Access to York Region MSPP 33% funding for in the year 2020.

VivaNext is slated for construction along Centre Street in the year 2015. With access to DC funding starting in 2014, access to regional funding in 2020 and an approximate project duration of 10 years, phasing starting in 2015 to coincide with VivaNext construction would maximize potential resources and minimize construction disruption. Coordination between the Region and VivaNext is recommended.

Yonge Street

Key Points

- Catalyst Project (approximately 10 year duration).
- Proposed Yonge Street Subway Extension stations are potential catalysts. Schedule currently unknown.
- Access to DC funding starting in the year 2016 and 2022 - 2025.
- Potential access to York Region MSPP funding pending application and negotiations.
- Potential 50% capital cost share with Richmond Hill.

Development Charge funding represent the only funding anchor in the year 2016 or between 2022 - 2025. Potential catalysts include the Proposed Yonge Street Subway Extension stations, however, these are not reliable. Therefore, potential construction could begin in 2023 to ensure access to the Growth Related DC funding. It is recommended that discussions with York Region, Richmond Hill and the TTC commence for coordination.

Carrville Centre

Key Points

- Generational Project (approximately 20 year duration).
- Potential York Region funding.
- Potential access to York Region MSPP 50% funding for Rutherford Road in the year 2018. Dufferin Street is also eligible for regional funding pending application to the region and acceptance.

The Carrville Centre master plan represents a large amount of uncertainty due to its reliance on developer construction. Access to York Region funding in 2018 represents the only foreseeable anchor and start date. Additional discussions with the Region for funding for Dufferin Street may yield additional considerations.

Steeles West

Key Points

- Generational Project (approximately 20 year duration).
- Catalyst identified as the Toronto-York Spadina Subway Extension station (Steeles).
- Potential access to York Region MSPP 50% funding for Keele Street in the year 2020. Steeles Avenue and Jane Street are eligible for Regional funding but are not scheduled.
- Access to DC funding starting in the year 2013, 2014, 2015, 2018, 2022 - 2025 and 2026 - 2031.

The Steeles TTC subway station is currently under construction and represents a catalyst for development in Steeles West. Given the projects long duration (potentially to the year 2033) it has the potential to access all DC and York Region funding. It is recommended that further discussions with York Region regarding Keele Street and Steeles Avenue be undertaken.

Vaughan Metropolitan Centre

Key Points

- Generational Project (approximately 20 year duration).
- Multiple catalysts identified as the Toronto-York Spadina Subway Extension station (Vaughan Metropolitan Centre) and VivaNext construction along Highway 7 in the year 2013. The construction of these elements form a mobility hub.
- Access to York Region MSPP 50% funding for Highway 7 from years 2014 to 2018. Jane Street is eligible for funding with negotiations.
- Access to DC funding from the years 2013 through 2022.

The mobility hub elements (TTC station and VivaNext BRT station) are already under construction and therefore signify the start of the project (2013). The duration of the project is largely dependent upon developers and therefore the project has the potential to access many funding sources.

Funding

A large portion of the financial strategy and the funding element of the financial strategy is found in the financial model discussed earlier. Over the course of adding development charge information into the model, it was found that of the seven intensification area projects, two projects did not have development charge funding assigned. The projects without development charge funding include Concord West and Carrville Centre. Consulting with City of Vaughan staff, it was found that two projects listed in the 2013 Vaughan Development Charge Study have been discontinued. City of Vaughan staff confirmed that the development charge funding assigned to the Highway 400 North Employment Area and the Vellore Village District Centre could be reassigned to other projects. Therefore, the development charge funding for the Highway 400 North Employment Area and Vellore Village District Centre were reassigned to Concord West and Carrville Centre, respectively. Concord West was assigned the \$543,244 originally listed for the Highway 400 North Employment Area while Carrville Centre was assigned the \$936,159 originally listed for the Vellore Village District Centre. The additional development charge funding for these projects have been added into the financial model to offset their capital costs and reduce the overall financial impact.

Design

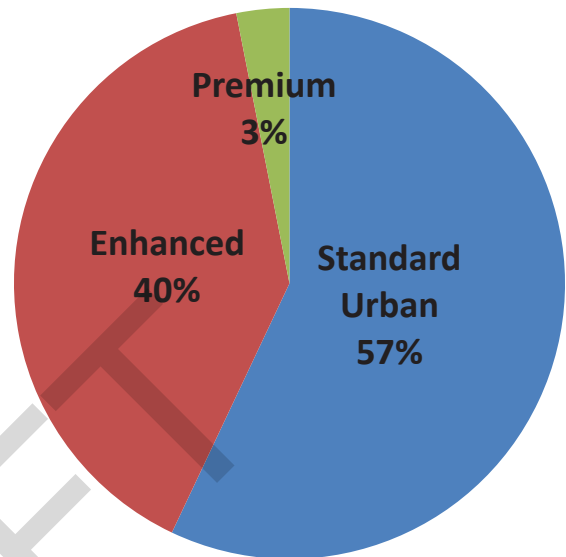
To further explore the potential to adjust the financial impact of the intensification projects, the design aspects of the intensification projects can be considered. There are two ways in which the design of the intensification projects have been altered:

- Level of Service Distribution
- Level of Service Scenarios

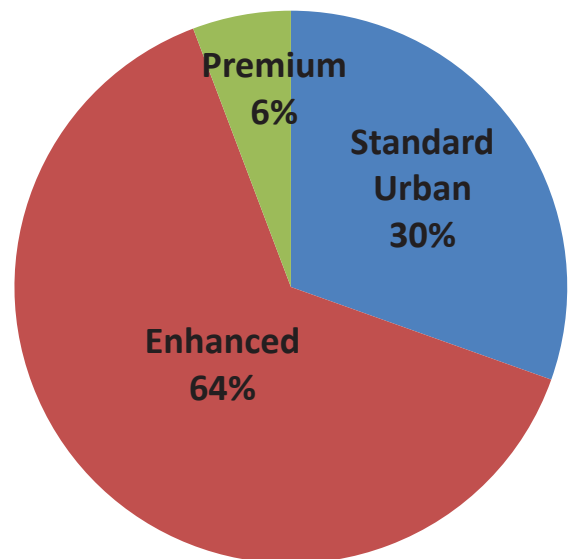
Level of Service Distribution

After assigning levels of service to streets and blocks of the intensification projects during the preliminary costing with the model the overall distribution of the levels of service for full build out of the intensification projects was considered. The distribution of the levels of service by length of streetscape showed that, as expected, Premium levels of service represented only a small portion of the total at 3%. However, Enhanced and Standard Urban levels of service were found to be 40% and 57% respectively. By cost, Premium levels of service represented 6% of the full construction cost, while Enhance and Standard Urban represented 64% and 30% respectively.

Premium levels of streets should be memorable and iconic streets which should stand the test of time and last many generations. Therefore, it was felt that the small percentage of Premium streets was reasonable. Enhanced level of service streetscapes are meant to be generational. As generations turn, styles change and given that enhanced levels of service have high visibility and located on streetscapes with high volume pedestrian traffic, may require updating to keep up to date to the styles of the time. Therefore, it was felt that enhanced levels of service should not be much more than approximately 1/3 of the total streetscapes.



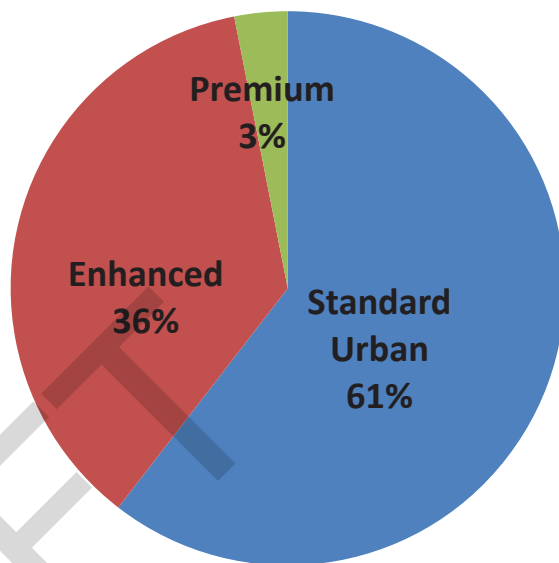
Level of Service Distribution by Length for all Intensification Projects



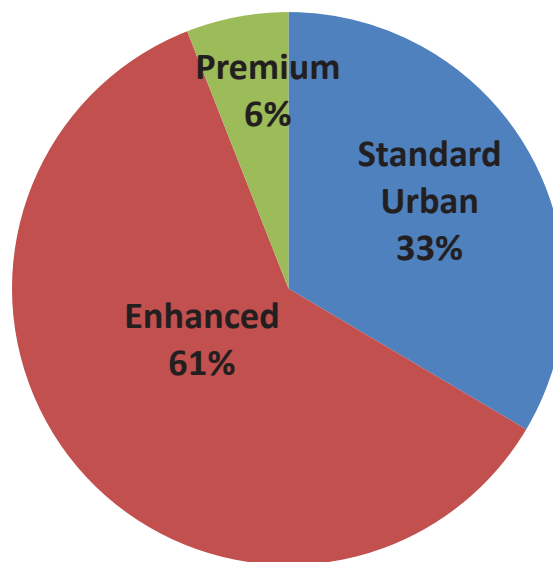
Level of Service Distribution by Cost for all Intensification Projects

In an effort to reach a more acceptable level of service distribution, the master plans were studied again to find locations where enhanced levels of service could potentially be reduced. It was found that within the Vaughan Metropolitan Centre there are two types of commercial streets: retail required and retail permitted. Streetscapes with retail permitted are not guaranteed to have retail which is one of the level of service criteria required for Enhanced levels of service. As a result, commercial streets with permitted retail were reassigned a Standard Urban level of service.

The reduction in level of service for the Vaughan Metropolitan Centre reduced the overall Enhanced level of service portion by 4% to 36% and increased the Standard Urban level of service portion by 4% to 61%. A distribution of 61% Standard Urban, 36% Enhanced and 3% Premium levels of service is considered acceptable. In terms of cost, the redistribution of level of service decreased the Enhanced and increased the Standard Urban by 3%.



Level of Service Distribution by Length for all Intensification Projects



Level of Service Distribution by Cost for all Intensification Projects

Level of Service Scenarios

Using the available components per the Standard Urban level of service, three Standard Urban design options were constructed. A recommended, low and high cost option for the Standard Urban level of service were created and each was run through the model costing for the seven intensification projects to determine the financial impact.

The reason for three different Standard Urban cost scenarios is two-fold:

- The Standard Urban level of service will represent the urbanized character of Vaughan.
- The Standard Urban level of service will become the new baseline from which other streetscapes are subsequently designed which has cost implications

The Standard Urban level of service represents the largest amount, by length, of streetscape for the intensification projects. Standard Urban levels of service are found mainly on neighbourhood streets with permanent residents of Vaughan. Enhanced and Premium level of service streets, by contrast, can be found in areas with a large amount of visitors. Therefore, the Standard Urban level of service represents the urbanized character that City of Vaughan residents will relate to and experience as home.

It is proposed that Vaughan's current engineering streetscape standard (Basic level of service) is not appropriate for urban streetscapes. The Basic level of service design does not address the needs for urban pedestrian traffic volumes or urban land-uses. The Basic \$515 per linear meter capital construction and \$15 per linear meter per year operations and maintenance costs addresses a suburban context with mainly softscape (sod), a minimal pedestrian clearway and minimal operations and maintenance (lawn mowing and basic pruning etc.).

Over the course of determining the Basic level of service, Vaughan staff found that \$5 per linear meter per year is currently budgeted for operations and maintenance of Basic streetscapes which does not cover all the operations and maintenance activities that should occur. Therefore, there is already a current funding gap of approximately \$10 per linear meter per year.

For intensification projects pedestrian traffic volumes are expected to be higher with intensive urban land-uses. A hardscape design treatment for an urban context is required for intensification projects to adequately serve urban pedestrian and land-use needs. To meet the needs of urban streetscapes, the current engineering streetscape design standard needs to change. The majority of the change is replacing softscape to hardscape increasing the capital construction cost by approximately \$450 to \$540 per linear meter (depending on the cost scenario).

Similarly, operations and maintenance costs must change to meet an urban standard of maintenance. In the urban context, street trees and hardscape areas require a wider array of maintenance activities, such as tree watering, planter maintenance and hardscape replacement to remain acceptable for high pedestrian traffic volumes. The urban condition requires an increase of approximately \$70 to \$100 per linear meter per year for operations and maintenance costs (depending on the cost scenario).

Since the Standard Urban level of service will be become the new baseline from which other urban streetscapes are subsequently designed from to higher levels of service, establishing the initial cost implications between the suburban context and urban context serves as important context for the different circumstances that urban streetscapes are in comparison to suburban.

	Levels of Service		
	STANDARD	ENHANCED	PREMIUM
OPTION 1 - LOW	\$966.25/lm Capital \$84.53/lm O&M	\$2,919.98/lm Capital \$152.28/lm O&M	\$3,389.50/lm Capital \$167.65/lm O&M
OPTION 2 - RECOMMENDED	\$974.25/lm Capital \$99.70/lm O&M	\$2,919.98/lm Capital \$152.28/lm O&M	\$3,389.50/lm Capital \$167.65/lm O&M
OPTION 3 - HIGH	\$1,055.93/lm Capital \$115.70/lm O&M	\$2,919.98/lm Capital \$152.28/lm O&M	\$3,389.50/lm Capital \$167.65/lm O&M

Level of Service Cost Options

The low Standard Urban level of service cost option offers typical poured in place concrete hardscape, trees, tree grates and street lighting. This option accommodates urban pedestrian traffic volumes, however provides little in pedestrian amenities.

To add visual pedestrian amenity to the streetscape, the recommended Standard Urban level of service cost option replaces the tree grates with a raised planter curb and perennials and ornamental grasses planting. The addition of the planters and planting increases the operations and maintenance activities necessary but also creates a much more pleasant urban streetscape.

Further public amenities are added in the high Standard Urban level of service cost option with the introduction of benches and trash receptacles. Similar to the recommended Standard Urban cost option, this increases the operations and maintenance activities required to maintain the streetscape in the future. However, the addition of benches and trash receptacles help to make streetscapes more inviting spaces for pedestrians to stay.



Intensification Projects

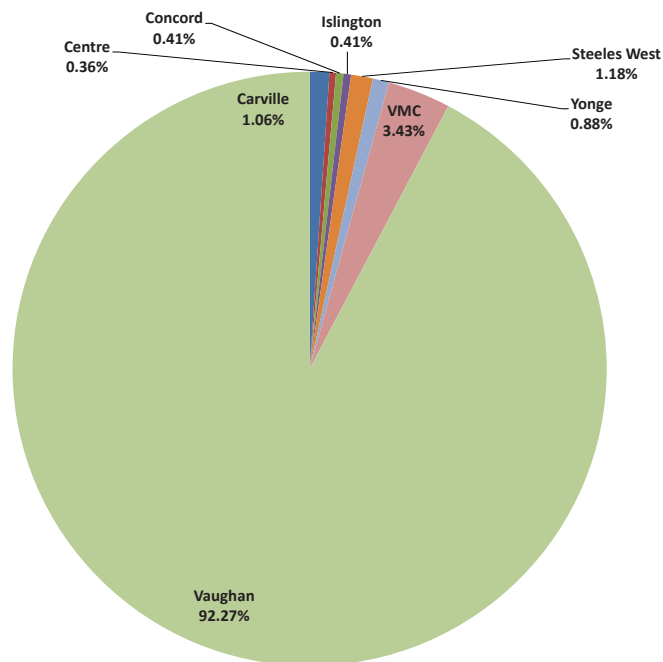
The seven intensification projects were originally designed through different means and each employed different assumptions to achieve a final cost. As such, it would be difficult to effectively compare and understand the true cost implications of the projects. As part of the financial strategy, the level of service concept was applied to each of the projects per the design strategy. The master plans were studied and based upon the information provided such as land-use, street classification, context, streetscape materials and design, a streetscape type and level of service was assigned to the streetscape blocks. Given that each project was done separately, there was a varying degree of detail and information and therefore certain assumptions were made for each project. The projects were then costed using the financial model to create a financial forecast over the next 10 years.

The 7 intensification projects included in this financial strategy were selected due to their importance and state of completion. As intensification continues, further master plan projects will evolve and the level of service concept will be applied to further projects adding to an ever evolving financial strategy.

Project Context

Before considering the projects and their costs, it is important to understand that the intensification projects make up a small amount of Vaughan's total amount of streetscapes. At present, Vaughan contains approximately 1,004,000 meters of streetscape. With the introduction of new roads in the seven intensification projects considered in this financial forecast, Vaughan will have approximately 1,043,853 meters of streetscape.

At full build-out, the seven intensification projects, considered in the financial forecast will amount to approximately 8% (approximately 89,524 meters) of the total length of streetscapes in all of Vaughan. Since the levels of service are only being applied to intensification projects (including Heritage Conservation Districts), only 8% of Vaughan's streetscapes will have a level of service applied to it. Therefore, the costs of upgrading streetscapes with a level of service are focused on a small amount of area. As other intensification projects are added, the ratio will change.

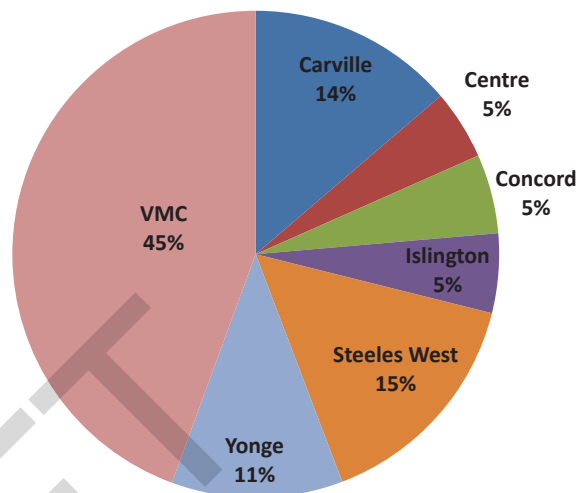


Total Length of Intensification Area Streetscapes by Project in Vaughan

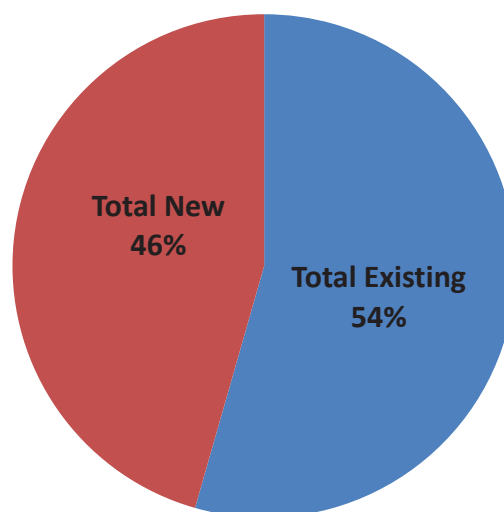
Of the seven projects, the Vaughan Metropolitan Centre (VMC) represents the largest level of service project at over 3% of Vaughan’s total length of streetscapes. The other projects each represent approximately 1% or less of Vaughan’s total streetscape length. By project, the Vaughan Metropolitan Centre makes up almost half of the total considered streetscape construction for the seven intensification projects at 45%. Steeles, Carrville and Yonge Street represent less than 15%, while Centre, Concord and Islington represent 5% of the total streetscape construction.

A large portion of the intensification projects is an upgrade of existing streetscapes. Of the total streetscape construction work found in the intensification areas considered, 46% of the streetscapes represent new streets. Existing streetscapes represent 54% of the streetscape.

A short description of each intensification project included in the financial forecast follows.



Total Length of intensification Area Streetscapes by Project



Intensification Areas New vs. Existing Streets

DRAFT

Vaughan Metropolitan Centre

Description

The Vaughan Metropolitan Centre (VMC) is a large complex downtown building project northeast of Highway 400 and Highway 407. Centred around a mobility hub with the interconnection of TTC, VivaNext and YRT transit services, the VMC is to be Vaughan’s new downtown core. Being the last TTC subway stop along the Toronto-York Spadina Subway Extension, the VMC will have a cultural and regional transit significance. The VMC has a high degree of uncertainty due to the large amount of privately owned land and a large network of new roads planned. Full build-out of the VMC will likely take over 25 years.

Approximate Length of Streetscape of Development
38,830 linear meters

Full Build-Out (Year 2033)

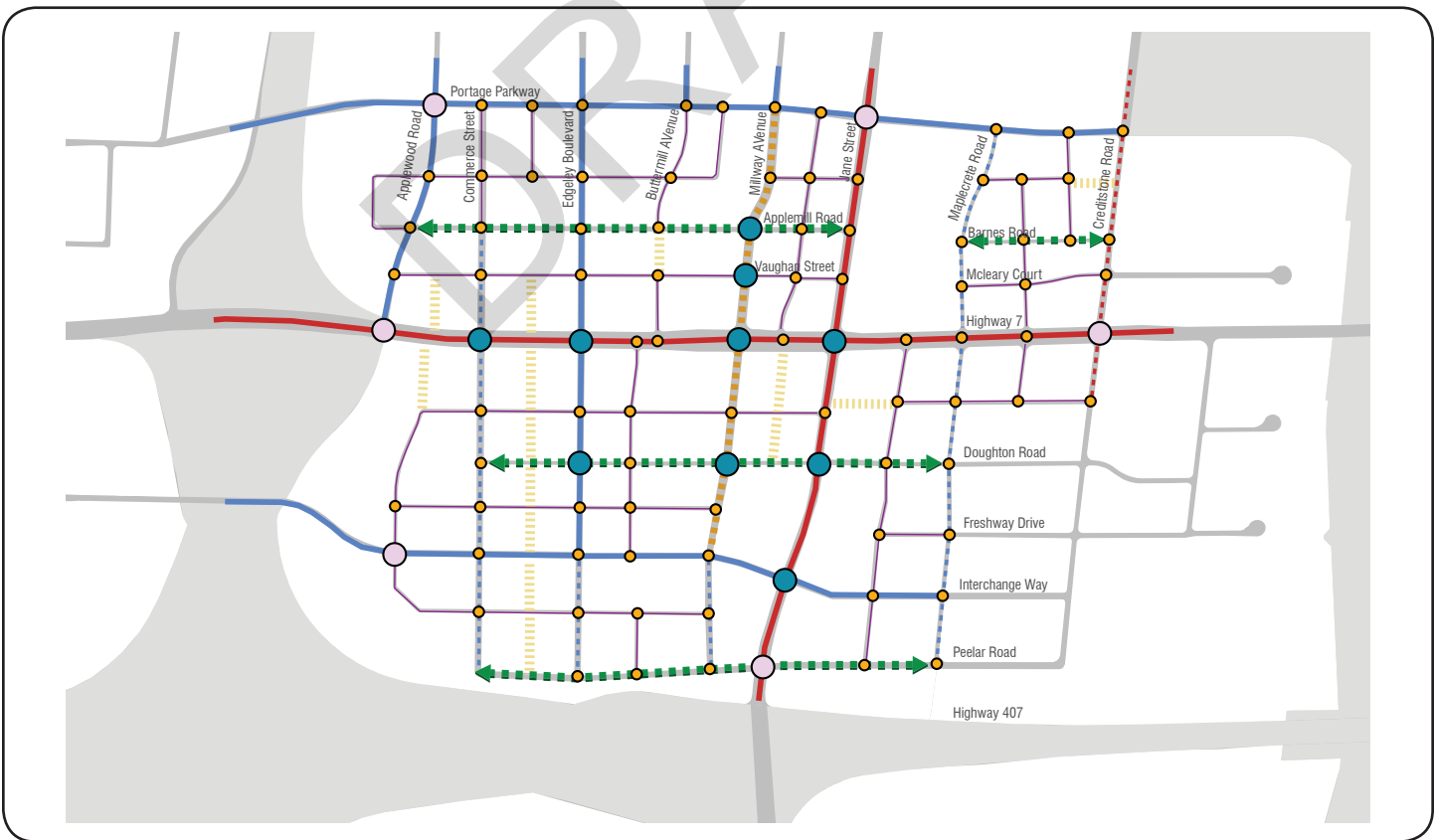
Total Capital Construction: \$76,320,759

Secured Funding: \$29,513,634

Un-Secured Funding: \$16,877,107

Best Case Average Tax Percentage Increase: 0.72%
(year over year)

Worst Case Average Tax Percentage Increase: 1.12%
(year over year)



Rate	10 Year Forecast											
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
A	Total Capital Cost	3,551,579	4,666,308	4,666,308	4,666,308	4,666,308	4,666,308	4,318,724	3,844,800	3,844,800	3,844,800	3,695,148
B	Secured Funding:											
	Development Charges	697,680	916,658	916,658	916,658	916,658	538,129	382,980	382,980	382,980	382,980	457,595
	Region of York - Approved Funding	522,059					1,610,510	1,932,612	1,932,612	1,932,612	1,932,612	351,660
	Developer Contribution (Local Roads)											
C	Unfunded (Tax Impact \$)	2,331,840	3,749,650	3,749,650	3,749,650	3,749,650	2,170,085	1,529,208	1,529,208	1,529,208	1,529,208	2,885,893
	Tax Percentage Increase	1.49%	2.28%	2.07%	1.92%	1.88%	1.07%	0.74%	0.72%	0.71%	0.70%	1.26%
D	Potential Funding:											
	Developer Contribution to Arterial/Collectors	627,079	823,900	823,900	823,900	823,900	833,989	764,604	764,604	764,604	764,604	815,491
	Region of York - Eligible (50% MSPP, 33% Other)		446,473	549,955	549,955	549,955	131,375					
E	Unfunded (Tax Impact \$)	1,704,761	2,479,277	2,375,795	2,375,795	2,375,795	1,204,721	764,604	764,604	764,604	2,008,042	2,070,402
	Tax Percentage Increase	1.09%	1.50%	1.31%	1.22%	1.19%	0.59%	0.37%	0.35%	0.35%	0.90%	0.91%
F	Operating and Maintenance Cost	205,555	270,073	270,073	270,073	270,073	272,421	249,485	249,485	249,485	249,485	195,370
	Tax Percentage Increase	0.13%	0.16%	0.15%	0.14%	0.14%	0.13%	0.12%	0.12%	0.12%	0.11%	0.09%
	Infrastructure Replacement Reserve Contribution	177,579	233,315	233,315	233,315	233,315	215,936	192,240	192,240	192,240	192,240	184,757
	Tax Percentage Increase	0.11%	0.14%	0.13%	0.12%	0.12%	0.11%	0.09%	0.09%	0.09%	0.09%	0.08%

Rate	10 Year Forecast										TOTAL
	2026	2027	2028	2029	2030	2031	2032	2033	2033	TOTAL	
A	Total Capital Cost	3,695,148	3,695,148	3,695,148	3,337,157	3,057,900	3,057,900	3,057,900	3,057,900	3,117,377	76,320,759
B	Secured Funding:										
	Development Charges	457,595	457,595	457,595	210,574	171,976	171,976	171,976	171,976	175,320	9,646,041
	Region of York - Approved Funding										522,059
	Developer Contribution (Local Roads)	351,660	351,660	351,660	1,586,274	1,584,828	1,584,828	1,584,828	1,615,664	1,615,664	19,345,534
C	Unfunded (Tax Impact \$)	2,885,893	2,885,893	2,885,893	1,540,310	1,301,096	1,301,096	1,301,096	1,326,393	46,807,125	
	Tax Percentage Increase	1.24%	1.21%	1.19%	0.62%	0.52%	0.51%	0.50%	0.50%	22.40%	
D	Potential Funding:										
	Developer Contribution to Arterial/Collectors	815,491	815,491	815,491	216,013	144,067	144,067	144,067	146,868	12,740,294	
	Region of York - Eligible (50% MSPP, 33% Other)				374,396	381,820	381,820	381,820	389,244	4,136,813	
E	Unfunded (Tax Impact \$)	2,070,402	2,070,402	2,070,402	949,900	775,209	775,209	775,209	790,281	29,930,018	
	Tax Percentage Increase	0.89%	0.87%	0.85%	0.38%	0.31%	0.30%	0.30%	0.30%	14.34%	
F	Operating and Maintenance Cost	195,370	195,370	195,370	213,208	199,172	199,172	199,172	203,046	4,570,494	
	Tax Percentage Increase	0.08%	0.08%	0.08%	0.09%	0.08%	0.08%	0.08%	0.08%	2.14%	
	Infrastructure Replacement Reserve Contribution	184,757	184,757	184,757	166,858	152,895	152,895	152,895	155,869	3,816,038	
	Tax Percentage Increase	0.08%	0.08%	0.08%	0.07%	0.06%	0.06%	0.06%	0.06%	1.79%	

Steeles West

Description

The Steeles West project, along Steeles Avenue West between Keele and Jane Streets, is centred around the construction of the Steeles TTC subway station along the Toronto-York Spadina Subway Extension. With close proximity to York University, the Steeles West project is expected to be a transit hub. There is a large amount of undeveloped private lands and new streets which should be encouraged to develop with the addition of the subway station. There is a high degree of uncertainty and full project build-out is expected to take over 25 years.

Approximate Length of Streetscape of Development

13,390 linear meters

Full Build-Out (Year 2033)

Total Capital Construction: \$31,540,444

Secured Funding: \$11,286,279

Un-Secured Funding: \$9,753,845

Best Case Average Tax Percentage Increase: 0.26% (year over year)

Worst Case Average Tax Percentage Increase: 0.50% (year over year)



Rate	10 Year Forecast											
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
A	Total Capital Cost	1,498,159	1,968,384	1,968,384	1,968,384	1,968,384	2,993,308	3,027,672	3,027,672	3,027,672	3,027,672	686,100
B	Secured Funding:											
	Development Charges	54,163	71,163	71,163	71,163	71,163	123,849	128,219	128,219	128,219	128,219	21,370
	Region of York - Approved Funding											
	Developer Contribution (Local Roads)	467,663	614,448	614,448	614,448	614,448	636,976	588,204	588,204	588,204	588,204	686,100
C	Unfunded (Tax Impact \$)	976,333	1,282,773	1,282,773	1,282,773	2,232,483	2,311,249	2,311,249	2,311,249	2,311,249	385,208	-
	Tax Percentage Increase	0.62%	0.78%	0.71%	0.66%	1.10%	1.12%	1.09%	1.07%	1.05%	0.17%	0.00%
D	Potential Funding:											
	Developer Contribution to Arterial/Collectors	169,860	223,174	223,174	223,174	1,016,335	1,155,625	1,155,625	1,155,625	1,155,625	192,604	-
	Region of York - Eligible (50% MSPP, 33% Other)	266,136	349,668	349,668	349,668	83,532						
E	Unfunded (Tax Impact \$)	540,337	709,931	709,931	709,931	1,132,616	1,155,624	1,155,624	1,155,624	1,155,624	192,605	-
	Tax Percentage Increase	0.35%	0.43%	0.39%	0.36%	0.56%	0.56%	0.55%	0.54%	0.53%	0.09%	0.00%
F	Operating and Maintenance Cost	70,251	92,300	92,300	92,300	140,183	141,760	141,760	141,760	141,760	70,222	51,301
	Tax Percentage Increase	0.04%	0.06%	0.05%	0.05%	0.07%	0.07%	0.07%	0.07%	0.07%	0.06%	0.02%
	Infrastructure Replacement Reserve Contribution	74,908	98,419	98,419	98,419	149,665	151,384	151,384	151,384	151,384	56,389	34,305
	Tax Percentage Increase	0.05%	0.06%	0.05%	0.05%	0.07%	0.07%	0.07%	0.07%	0.07%	0.07%	0.02%

Rate	10 Year Forecast										TOTAL	
	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035		
A	Total Capital Cost	686,100	686,100	686,100	676,644	625,932	625,932	625,932	625,932	638,124	638,124	31,540,444
B	Secured Funding:											
	Development Charges				83,755	85,417	85,417	85,417	85,417	87,084	87,084	1,424,000
	Region of York - Approved Funding											
	Developer Contribution (Local Roads)	686,100	686,100	686,100	144,968	83,712	83,712	83,712	83,712	85,318	85,318	9,862,279
C	Unfunded (Tax Impact \$)	-	-	-	447,922	456,803	456,803	456,803	456,803	465,722	465,722	20,254,165
	Tax Percentage Increase	0.00%	0.00%	0.00%	0.18%	0.18%	0.18%	0.17%	0.17%	0.17%	0.17%	9.91%
D	Potential Funding:											
	Developer Contribution to Arterial/Collectors	-	-	-	187,441	191,158	191,158	191,158	191,158	194,887	194,887	7,849,794
	Region of York - Eligible (50% MSPP, 33% Other)				30,536	31,141	31,141	31,141	31,141	31,752	31,752	1,904,051
E	Unfunded (Tax Impact \$)	-	-	-	229,945	234,504	234,504	234,504	234,504	239,083	239,083	10,500,320
	Tax Percentage Increase	0.00%	0.00%	0.00%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	5.16%
F	Operating and Maintenance Cost	51,301	51,301	51,301	57,042	53,379	53,379	53,379	53,379	54,419	54,419	1,693,696
	Tax Percentage Increase	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.80%
	Infrastructure Replacement Reserve Contribution	34,305	34,305	34,305	33,832	31,297	31,297	31,297	31,297	31,906	31,906	1,577,022
	Tax Percentage Increase	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.77%

Carrville Centre

Description

Carrville Centre, located at Dufferin Street and Rutherford Road, acts as a new district centre node for the community. The project considers the development of a large amount of surrounding undeveloped private lands. A series of new roads will service the future development. Given the large amount of private lands there is a high degree of uncertainty in the duration of the project. The Carrville Centre will likely take more than 25 years to reach full build-out.

Approximate Length of Streetscape of Development
12,010 linear meters

Full Build-Out (Year 2037)

Total Capital Construction: \$19,687,655

Secured Funding: \$3,877,604

Un-Secured Funding: \$7,720,683

Best Case Average Tax Percentage Increase: 0.16%
(year over year)

Worst Case Average Tax Percentage Increase: 0.32%
(year over year)

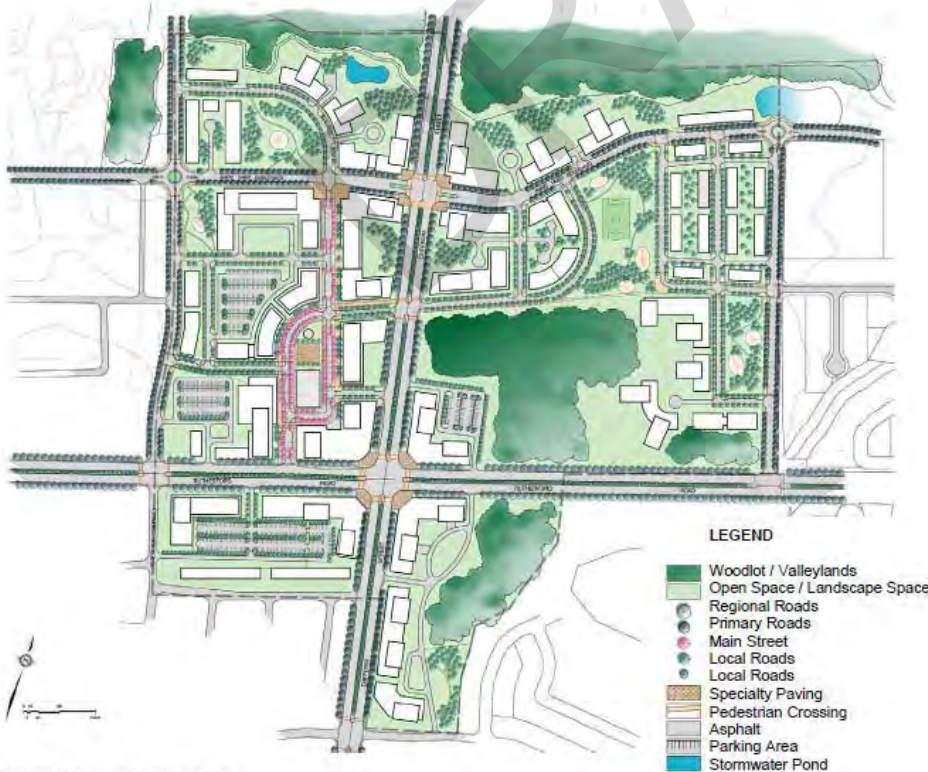


Figure 14: Conceptual Landscape Plan

Rate	10 Year Forecast											
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
A	Total Capital Cost	675,373	887,352	385,742	219,504	219,504	219,504	219,504	219,504	219,504	219,504	1,668,864
B	Secured Funding:											
	Development Charges	56,969	74,850	32,538	18,515	18,515	18,515	18,515	18,515	18,515	18,515	50,372
	Region of York - Approved Funding											
	Developer Contribution (Local Roads)											
C	Unfunded (Tax Impact \$)	618,404	812,502	353,204	200,989	200,989	200,989	200,989	200,989	200,989	200,989	1,618,492
	Tax Percentage Increase	0.31%	0.40%	0.17%	0.10%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.65%
D	Potential Funding:											
	Developer Contribution to Arterial/Collectors	75,875	99,689	58,031	43,222	43,222	43,222	43,222	43,222	43,222	43,222	809,246
	Region of York - Eligible (50% MSPP, 33% Other)	179,034	235,227	97,407	52,063	52,063	52,063	52,063	52,063	52,063	52,063	10,836
E	Unfunded (Tax Impact \$)	363,496	477,585	197,767	105,704	105,704	105,704	105,704	105,704	105,704	105,704	809,246
	Tax Percentage Increase	0.18%	0.24%	0.10%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.04%	0.33%
F	Operating and Maintenance Cost	57,595	75,673	32,896	18,719	18,719	18,719	18,719	18,719	18,719	18,719	75,743
	Tax Percentage Increase	0.03%	0.04%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.03%
	Infrastructure Replacement Reserve Contribution	33,769	44,368	19,287	10,975	10,975	10,975	10,975	10,975	10,975	10,975	83,443
	Tax Percentage Increase	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%

Rate	10 Year Forecast										TOTAL	
	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039		
A	Total Capital Cost	1,668,864	1,668,864	1,668,864	1,685,099	1,562,532	1,562,532	1,562,532	1,592,938	1,592,938	1,592,938	19,687,655
B	Secured Funding:											
	Development Charges	50,372	50,372	50,372	80,408	77,294	77,294	77,294	78,799	78,799	78,799	936,148
	Region of York - Approved Funding											
	Developer Contribution (Local Roads)				576,849	588,288	588,288	588,288	599,743	599,743	599,743	2,941,456
C	Unfunded (Tax Impact \$)	1,618,492	1,618,492	1,618,492	1,027,842	896,950	896,950	896,950	914,396	914,396	914,396	15,810,052
	Tax Percentage Increase	0.64%	0.63%	0.62%	0.38%	0.33%	0.32%	0.32%	0.32%	0.32%	0.32%	6.34%
D	Potential Funding:											
	Developer Contribution to Arterial/Collectors	809,246	809,246	809,246	513,921	448,475	448,475	448,475	457,198	457,198	457,198	6,833,738
	Region of York - Eligible (50% MSPP, 33% Other)											886,945
E	Unfunded (Tax Impact \$)	809,246	809,246	809,246	513,920	448,475	448,475	448,475	457,198	457,198	457,198	8,089,369
	Tax Percentage Increase	0.32%	0.31%	0.31%	0.19%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	3.26%
F	Operating and Maintenance Cost	75,743	75,743	75,743	134,039	129,617	129,617	129,617	132,140	132,140	132,140	1,327,897
	Tax Percentage Increase	0.03%	0.03%	0.03%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.52%
	Infrastructure Replacement Reserve Contribution	83,443	83,443	83,443	84,255	78,127	78,127	78,127	79,647	79,647	79,647	984,383
	Tax Percentage Increase	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.39%

Yonge Street

Description

The Yonge Street streetscape project is located along Yonge Street between Steeles Avenue and Bantry Avenue. It is a regional road and has significant cultural importance. The intent is that the streetscape enhancements could encourage infill, redevelopment and density of adjacent private land uses. Along Yonge Street, there are various potential nodes including stations for the proposed Yonge Street Subway Extension and CN Railway public space. There is a varying amount of uncertainty given the different stakeholders including TTC, private land developers and the City of Vaughan. The project is envisioned to be constructed over at least a 10 year period.

Approximate Length of Streetscape of Development
9,960 linear meters

Full Build-Out (Year 2033)

Total Capital Construction: \$27,430,339

Secured Funding: \$1,014,171

Un-Secured Funding: \$9,104,844

Best Case Average Tax Percentage Increase: 0.65%
(year over year)

Worst Case Average Tax Percentage Increase: 1.00%
(year over year)



Rate	10 Year Forecast											TOTAL		
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033			
A	Total Capital Cost	2,087,752	2,743,032	2,743,032	2,743,032	2,743,032	2,743,032	2,743,032	2,743,032	2,743,032	2,743,032	2,743,032	655,299	27,430,339
B	Secured Funding:													-
	Development Charges	77,190	101,417	101,417	101,417	101,417	101,417	101,417	101,417	101,417	101,417	101,417	24,228	1,014,171
	Region of York - Approved Funding													-
	Developer Contribution (Local Roads)													-
C	Unfunded (Tax Impact \$)	2,010,562	2,641,615	2,641,615	2,641,615	2,641,615	2,641,615	2,641,615	2,641,615	2,641,615	2,641,615	2,641,615	631,071	26,416,168
	Tax Percentage Increase	0.92%	1.18%	1.16%	1.13%	1.11%	1.09%	1.07%	1.05%	1.03%	1.01%	1.01%	0.24%	10.96%
D	Potential Funding:													-
	Developer Contribution to Arterial/Collectors	44,021	57,837	57,837	57,837	57,837	57,837	57,837	57,837	57,837	57,837	57,837	13,817	578,373
	Region of York - Eligible (50% MSPP, 33% Other)	648,959	852,647	852,647	852,647	852,647	852,647	852,647	852,647	852,647	852,647	852,647	203,694	8,526,471
E	Unfunded (Tax Impact \$)	1,317,583	1,731,131	1,731,131	1,731,131	1,731,131	1,731,131	1,731,131	1,731,131	1,731,131	1,731,131	1,731,131	413,560	17,311,324
	Tax Percentage Increase	0.60%	0.77%	0.76%	0.74%	0.73%	0.71%	0.70%	0.69%	0.67%	0.66%	0.66%	0.15%	7.19%
F	Operating and Maintenance Cost	102,659	134,880	134,880	134,880	134,880	134,880	134,880	134,880	134,880	134,880	134,880	32,222	1,348,799
	Tax Percentage Increase	0.05%	0.06%	0.06%	0.06%	0.06%	0.06%	0.05%	0.05%	0.05%	0.05%	0.05%	0.01%	0.56%
	Infrastructure Replacement Reserve Contribution	104,388	137,152	137,152	137,152	137,152	137,152	137,152	137,152	137,152	137,152	137,152	32,765	1,371,517
	Tax Percentage Increase	0.05%	0.06%	0.06%	0.06%	0.06%	0.06%	0.06%	0.05%	0.05%	0.05%	0.05%	0.01%	0.57%

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Concord West

Description

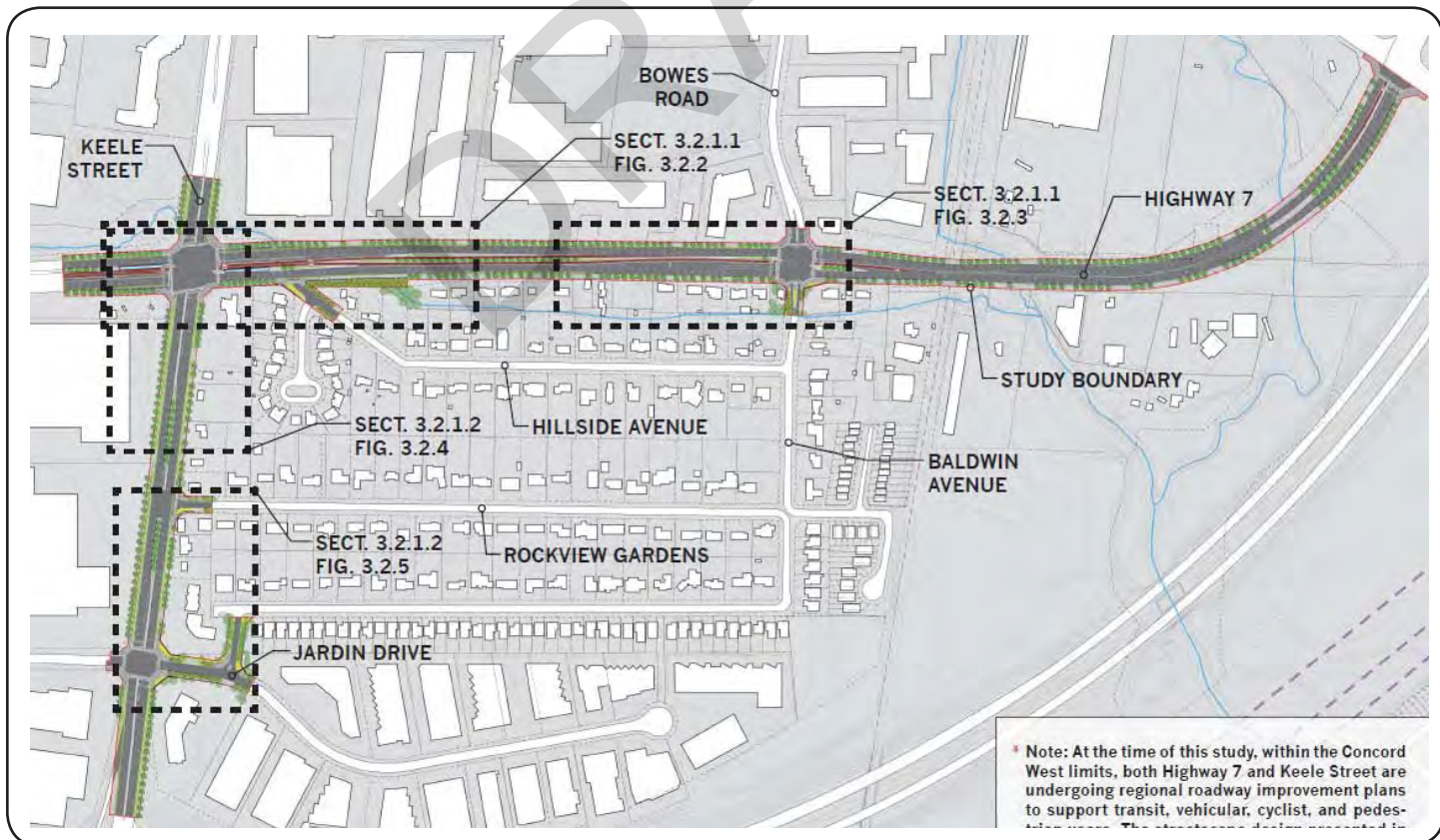
Concord West is part of the VivaNext bus rapid transit extension along Highway 7. The project consists of streetscape enhancements along Highway 7 and Keele Street. Adjacent land-uses are primarily mixed-use retail / commercial and low density residential. Much of the adjacent lands are built in a suburban context with the expectation of potential infill, enhancement and densification along the mixed-use retail / commercial lands. There are small gateway nodes and a nearby Go Transit station. Given the busy traffic on Highway 7 and Keele Street, both regional roads, the project has a certain complexity as a transit intensification corridor.

Approximate Length of Streetscape of Development

4,600 linear meters

Full Build-Out (Year 2024)

Total Capital Construction:	\$7,007,610
Secured Funding:	\$543,249
Un-Secured Funding:	\$3,152,684
Best Case Average Tax Percentage Increase:	0.16% (year over year)
Worst Case Average Tax Percentage Increase:	0.32% (year over year)



Rate	10 Year Forecast										TOTAL	
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		
A	Total Capital Cost	510,864	671,208	671,208	671,208	671,208	671,208	671,208	671,208	1,675,453	122,837	7,007,610
B	Secured Funding:											
	Development Charges	37,051	48,680	48,680	48,680	48,680	48,680	48,680	48,680	153,903	11,535	543,249
	Region of York - Approved Funding											
	Developer Contribution (Local Roads)											
C	Unfunded (Tax Impact \$)	473,813	622,528	622,528	622,528	622,528	622,528	622,528	622,528	1,521,550	111,302	6,464,361
	Tax Percentage Increase	0.29%	0.34%	0.32%	0.31%	0.31%	0.30%	0.29%	0.29%	0.69%	0.05%	3.20%
D	Potential Funding:											
	Developer Contribution to Arterial/Collectors	-	-	-	-	-	-	-	-	-	-	
	Region of York - Eligible (50% MSPP, 33% Other)	236,907	311,264	311,264	311,264	311,264	311,264	311,264	311,264	687,239	49,690	3,152,684
E	Unfunded (Tax Impact \$)	236,906	311,264	311,264	311,264	311,264	311,264	311,264	311,264	834,312	61,612	3,311,677
	Tax Percentage Increase	0.14%	0.17%	0.16%	0.16%	0.15%	0.15%	0.14%	0.38%	0.03%		1.63%
F	Operating and Maintenance Cost	33,863	44,492	44,492	44,492	44,492	44,492	44,492	44,492	139,835	10,475	495,614
	Tax Percentage Increase	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.06%	0.00%	0.24%
	Infrastructure Replacement Reserve Contribution	25,543	33,560	33,560	33,560	33,560	33,560	33,560	33,560	83,773	6,142	350,381
	Tax Percentage Increase	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.04%	0.00%	0.17%

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Centre Street

Description

Centre Street is a major transportation corridor between Dufferin and Bathurst Streets. Currently, Centre Street is in a suburban form surrounded largely by low density residential and big box store formats. The intent is that streetscape enhancements could encourage infill and redevelopment of mixed-use retail / commercial lands to create a more urban space with pedestrian activity. The inclusion of a bus rapid transit route along Centre Street provides a catalyst for the development to take place. The Centre Street project will likely be developed over the course of 10 years or more.

Approximate Length of Streetscape of Development
4,050 linear meters

Full Build-Out (Year 2025)

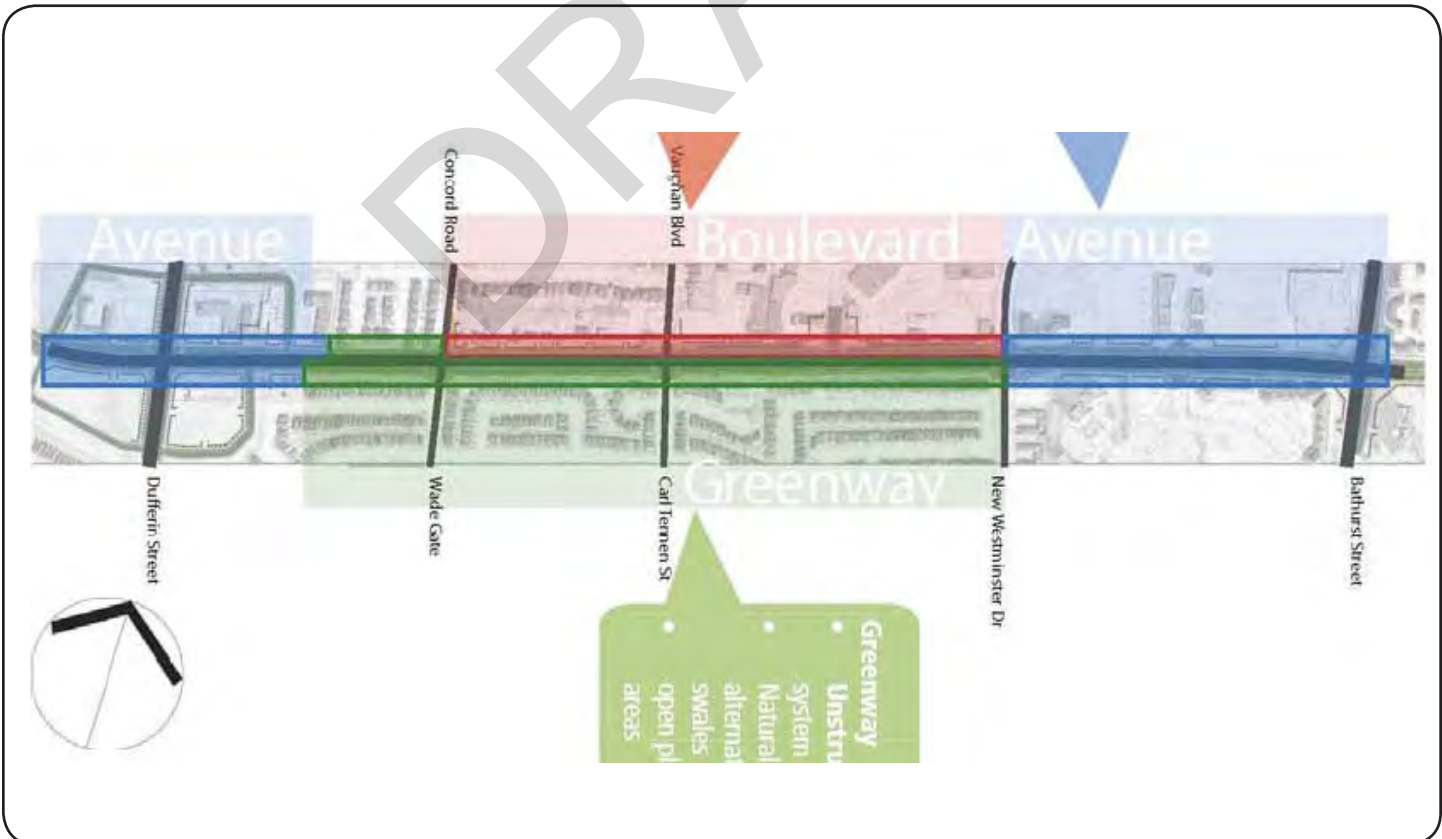
Total Capital Construction: \$14,184,095

Secured Funding: \$753,769

Un-Secured Funding: \$6,715,164

Best Case Average Tax Percentage Increase: 0.30%
(year over year)

Worst Case Average Tax Percentage Increase: 0.60%
(year over year)



Rate	10 Year Forecast										TOTAL		
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024		2025	
A	Total Capital Cost	1,079,569	1,418,412	1,418,412	1,418,412	1,418,412	1,418,412	1,418,412	1,418,412	1,418,412	1,418,412	338,818	14,184,095
B	Secured Funding:												
	Development Charges	57,370	75,377	75,377	75,377	75,377	75,377	75,377	75,377	75,377	75,377	18,006	753,769
	Region of York - Approved Funding												
	Developer Contribution (Local Roads)												
C	Unfunded (Tax Impact \$)	1,022,199	1,343,035	1,343,035	1,343,035	1,343,035	1,343,035	1,343,035	1,343,035	1,343,035	1,343,035	320,812	13,430,326
	Tax Percentage Increase	0.62%	0.74%	0.69%	0.67%	0.66%	0.65%	0.64%	0.62%	0.61%	0.60%	0.14%	6.65%
D	Potential Funding:												
	Developer Contribution to Arterial/Collectors	-	-	-	-	-	-	-	-	-	-	-	-
	Region of York - Eligible (50% MSPP, 33% Other)	511,100	671,518	671,518	671,518	671,518	671,518	671,518	671,518	671,518	671,518	160,406	6,715,164
E	Unfunded (Tax Impact \$)	511,100	671,517	671,517	671,517	671,517	671,517	671,517	671,517	671,517	671,517	160,406	6,715,162
	Tax Percentage Increase	0.31%	0.37%	0.34%	0.34%	0.33%	0.32%	0.31%	0.31%	0.30%	0.07%		3.32%
F	Operating and Maintenance Cost	46,917	61,643	61,643	61,643	61,643	61,643	61,643	61,643	61,643	61,643	14,725	616,429
	Tax Percentage Increase	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.01%	0.31%
	Infrastructure Replacement Reserve Contribution	53,978	70,921	70,921	70,921	70,921	70,921	70,921	70,921	70,921	70,921	16,941	709,205
	Tax Percentage Increase	0.03%	0.04%	0.04%	0.04%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.01%	0.35%

Islington Avenue

Description

The Islington Avenue project is located in Kleinburg and is a special project since it is a Heritage Conservation District. The area is largely low density residential with a village core. The heritage significance of Kleinburg means that there will be little intensification development and keeping the character of the area is of the utmost importance. The streetscape enhancement of the existing streets is to support the Heritage Conservation District and can likely be constructed over a 2 year period.

Approximate Length of Streetscape of Development

4,620 linear meters

Full Build-Out (Year 2025)

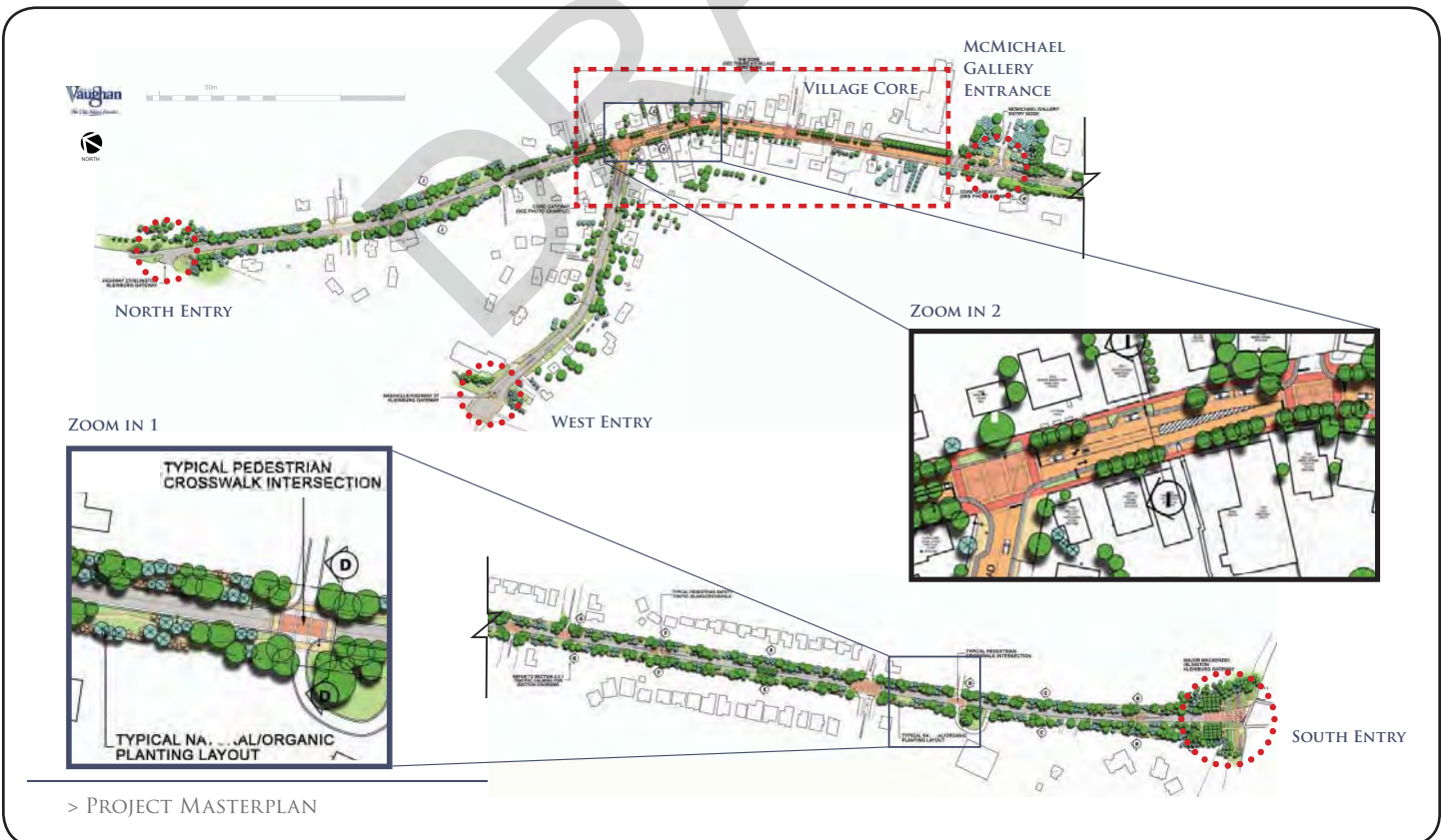
Total Capital Construction: \$8,337,344

Secured Funding: \$1,029,298

Un-Secured Funding: \$2,339,249

Best Case Average Tax Percentage Increase: 0.74% (year over year)

Worst Case Average Tax Percentage Increase: 1.08% (year over year)



> PROJECT MASTERPLAN

Rate	10 Year Forecast			
	2023	2024	2025	TOTAL
A Total Capital Cost	592,616	6,044,018	1,700,709	8,337,344
B Secured Funding:				
Development Charges	113,006	718,107	198,185	1,029,298
Region of York - Approved Funding				-
Developer Contribution (Local Roads)				-
C Unfunded (Tax Impact \$)				
Unfunded (Tax Impact \$)	479,610	5,325,911	1,502,524	7,308,046
Tax Percentage Increase	0.22%	2.38%	0.66%	3.25%
D Potential Funding:				
Developer Contribution to Arterial/Collectors	-	156,784	45,518	202,302
Region of York - Eligible (50% MSPP, 33% Other)		1,656,135	480,812	2,136,947
E Unfunded (Tax Impact \$)				
Unfunded (Tax Impact \$)	479,610	3,512,993	976,194	4,968,797
Tax Percentage Increase	0.22%	1.57%	0.43%	2.21%
F Operating and Maintenance Cost				
Operating and Maintenance Cost	50,538	372,450	103,525	526,513
Tax Percentage Increase	0.02%	0.17%	0.05%	0.23%
Infrastructure Replacement Reserve Contribution				
Infrastructure Replacement Reserve Contribution	29,631	302,201	85,035	416,867
Tax Percentage Increase	0.01%	0.13%	0.04%	0.19%

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Financial Forecast

The financial forecast was explored for the next 10 years from 2014 to 2023. However, full construction build out for the seven intensification projects will not happen until the year 2037 meaning that projects such as Yonge Street and Islington Avenue will not have a large impact given their late construction start times.

Presented here is the recommended Standard Urban level of service cost scenario with discussion on the differences the low and high scenarios present. Tables and charts for the low and high Standard Urban cost scenarios can be found in Appendix F.

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Limiting Assumptions

There are a number of key assumptions which drive any approach to forecasting likely capital expenditures on the part of the City. As much as anything, the strategy is not one which is born of external factors which direct the City to undertake capital projects – but rather, a combination of external forces which, combined with active management by the City in its forward planning can result in a reasonable approach to financial forecasts. It is important to recognize that any forecast presented (this represents the first iteration of such forecast based on the output of the financial model) is speculative in nature and should be used as a basis for further discussion and decision making on the overall City-wide development priorities. Specifically, the assumptions which are the basis for the financial forecast are more important at this stage than the forecast itself. It is important that these assumptions, which will change over time and as further work is undertaken on each of the specific projects in question, are reviewed, appraised and re-evaluated as necessary to produce a reasonable financial forecast based, commonly agreed and relevant assumptions and principal priorities.

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Specific limiting assumptions in providing this forecast are as follows:

Model Driven

The forecast represents an output of the financial model which provides the opportunity for the City to estimate the “order of magnitude” capital cost associated with the seven individual projects which comprise the study. Further, this model provides an estimate of both the operating costs and the capital reserve necessary to enable these projects to be undertaken and at the level of service chosen.

Financial Impact and Funding

Municipal fiscal impact considerations require an assessment of the revenue potential associated with the broader development to which the streetscape is part of. The relative contribution of public realm improvements and public sector development will determine this over time. As presented earlier in the project, in broad terms there are significant economic benefits associated with improved city infrastructure, public realm improvements and other measures which help create a quality of public gathering space, commercial environments, and institutional as well as residential spaces that are broadly considered to have resulted in significant economic gain for communities.

A key purpose of the model in estimating financial impact is the identification and qualification of the likely funding sources available to secure each of the projects in question. This qualification is always at a conceptual stage until sufficient detail exists for more precise estimates of costs and their allocation. This includes a range of funding sources including eligible funding from the City of Vaughan Development Charges, contributions by the private sector through development of lands along the streets in question, funding provided by Regional partners, and a resulting amount of funding which is due to the City of Vaughan’s account and represents for purposes of this analysis as funding to be secured through the tax base.

Special Projects

Where special projects such as VivaNext create the opportunity to provide a certain level of infrastructure – the financial model does not include estimates of the cost associated with VivaNext. However, the model does estimate the cost associated with the chosen level of service for relevant projects – to the extent that a level of service exceeds that provided for in any agreement with VivaNext, the balance is assumed to be funded from the City. That represents a manual calculation that can be undertaken by the City upon review of these special agreements with other agencies.

Reliance on Development

In conceptualizing an approach to phasing of these projects, it is important to distinguish clear characteristics of each as follows:

- Those projects which are generational in scope (extending 25+ years);
- Those projects which are shorter term and lower cost;
- Those projects which are more likely to be in the control of the City by virtue of the responsibility falling on public agencies for funding as opposed to occurring alongside and as a direct result of private sector development; and
- Those projects which fall essentially into the category of being driven by land use development – and as such, the control of phasing is subject to the realities of the market place in terms of the pace of development over the coming years.

Recommended

Capital Construction Cost and Funding

As indicated earlier, it is difficult to accurately forecast the financial impacts with a large amount of uncertainty. Given that much of the streetscape development is dependant upon developer schedules and the market, the phasing of the streetscape development may extend into future years reducing the 10 year forecasted financial impact. It is also important to note that future changes to the population and tax base changes the context in which the streetscape projects are being implemented. Regardless of the forecasted financial commitment, each streetscape project will be handled through the current budget process with appropriate knowledge of the planning context of the time.

However, based upon the assumptions made in this report and the information currently possessed, the overall financial capital cost impact of the intensification projects over the 10 year forecast is a total of \$90,989,412. Of the \$91 million, there is approximately \$24,790,363 (27%) in secured funding available from development charges, approved York Region funding and developer contributions to local roads. Potential funding represents \$29,202,857 (32%) from sources such as developer contributions to arterial and collector construction, grants and York Region eligible funding.

The uncertainty and large amount of potential funding mean that there is a drastic range for Vaughan's potential financial commitment over the next 10 years. In a best case scenario where all potential funding is secured the remaining Vaughan financial commitment would be \$36,996,192 or 41% of the total capital construction cost, while funding from other sources would represent 59%. The total Vaughan financial commitment for capital construction costs would be a total tax percentage increase of approximately 19%. Year by year, the tax percentage increase to cover capital construction costs varies between approximately 1.4% and 2.4% with an average of 1.9%.

In a worst case scenario where all potential funding can not be secured, the remaining Vaughan financial commitment would be \$66,199,049 or 73% of the total capital construction cost with funding from other sources representing only 27%. The total Vaughan financial commitment for capital construction costs would be a total tax percentage increase of approximately

34%. The worst case scenario represents a varying tax percentage increase for capital construction costs between 2.12% and 4.28% with an average of 3.38%.

Operations and Maintenance and Infrastructure Replacement Reserve

As streetscapes are completed over the 10 year forecast, operations and maintenance activities will begin. Between 2014 to the end of year 2023, operations and maintenance costs for the completed portions of the intensification projects will amount to a total of \$5,103,598. The operations and maintenance costs will amount to a year over year approximate average tax percentage increase of 0.25%.

Infrastructure replacement reserve contributions will total \$4,549,471 between the years of 2014 and 2023 and represent an average approximate year over year tax percentage increase of 0.23%.

Ideally, if all funding is secured, the year over year average tax percentage increase for capital construction, operations and maintenance and infrastructure replacement reserve would be 2.39%. However, the worst case scenario would represent a 3.87% average tax percentage increase year over year.

Low and High Cost Standard Urban Scenarios

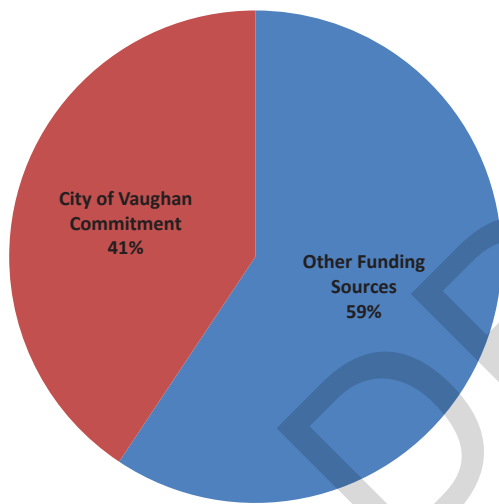
Comparison of the low cost Standard Urban scenario to the recommended scenario shows a negligible difference in the best case funding scenario of \$101,664 reduction in Vaughan's financial commitment for capital construction. In the worst case scenario, the difference is also small at \$160,329 (see Appendix F).

However, in the high cost Standard Urban scenario, the Vaughan's financial commitment increases by \$1,037,724 in the best case scenario and \$1,636,526 in the worst case scenario. The high cost Standard Urban scenario represents a 1% tax percentage increase in the best and worst case scenarios.

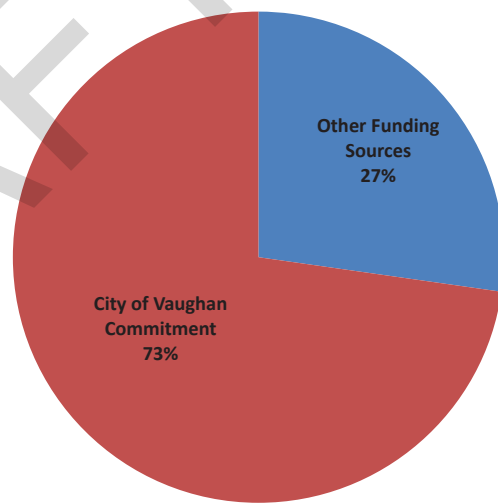
Operations and maintenance also exhibits a difference in cost between the low, recommended and high cost Standard Urban scenarios. The low option exhibits a \$360,661 total savings over the 10 year forecast, whereas the high option shows an increase of \$380,376.

	2013	10 Year Forecast										TOTAL
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Total Capital Cost	\$0	\$5,049,738	\$8,225,125	\$8,724,312	\$8,724,312	\$9,399,685	\$10,289,003	\$9,347,834	\$9,181,596	\$9,181,596	\$12,866,210	\$90,989,412
Secured Funding:												
Development Charges	\$0	\$751,843	\$1,082,242	\$1,111,878	\$1,111,878	\$1,168,847	\$860,885	\$667,794	\$653,771	\$653,771	\$949,190	\$9,012,099
Region of York - Approved Funding	\$0	\$522,059	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$522,059
Developer Contribution (Local Roads)	\$0	\$467,663	\$614,448	\$614,448	\$614,448	\$614,448	\$2,247,486	\$2,520,816	\$2,520,816	\$2,520,816	\$2,520,816	\$15,256,205
Potential Funding:												
Developer Contribution to Arterial/Major Collectors	\$0	\$796,939	\$1,047,074	\$1,047,074	\$1,047,074	\$1,122,949	\$1,950,013	\$1,978,259	\$1,963,451	\$1,963,451	\$2,007,471	\$14,923,754
Region of York - Eligible (50% MSPP, 33% Other)	\$0	\$266,136	\$1,544,147	\$1,882,405	\$1,882,405	\$2,061,439	\$1,432,916	\$1,080,189	\$1,034,845	\$1,034,845	\$2,059,778	\$14,279,103
Best Case Vaughan Financial Commitment	\$0	\$2,245,097	\$3,937,214	\$4,068,508	\$4,068,508	\$4,432,003	\$3,797,703	\$3,100,776	\$3,008,714	\$3,008,714	\$5,328,955	\$36,996,192
Best Case Tax Percentage Impact	0.00%	1.44%	2.39%	2.25%	2.09%	2.23%	1.87%	1.50%	1.42%	1.40%	2.43%	19.00%
Worst Case Vaughan Financial Commitment	\$0	\$3,308,173	\$6,528,435	\$6,997,986	\$6,997,986	\$7,616,390	\$7,180,632	\$6,159,224	\$6,007,009	\$6,007,009	\$9,396,204	\$66,199,049
Worst Case Tax Percentage Impact	0.00%	2.12%	3.96%	3.87%	3.59%	3.83%	3.54%	2.98%	2.84%	2.79%	4.28%	33.78%

Secured vs. Potential Funding (Recommended Cost Scenario)



10 Year Forecast Best Case Funding Scenario (Recommended Cost Scenario)



10 Year Forecast Worst Case Funding Scenario (Recommended Cost Scenario)

	2013	10 Year Forecast										TOTAL
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Operating and Maintenance Cost	\$0	\$275,806	\$443,153	\$468,508	\$468,508	\$526,103	\$594,411	\$530,275	\$516,098	\$516,098	\$764,638	\$5,103,598
Tax Percentage Increase	0.00%	0.18%	0.27%	0.26%	0.24%	0.26%	0.29%	0.26%	0.24%	0.24%	0.35%	2.59%
Infrastructure Replacement Reserve Contribution	\$0	\$252,487	\$411,256	\$436,216	\$436,216	\$469,984	\$514,450	\$467,392	\$459,080	\$459,080	\$643,310	\$4,549,471
Tax Percentage Increase	0.00%	0.16%	0.25%	0.24%	0.22%	0.24%	0.25%	0.23%	0.22%	0.21%	0.29%	2.31%

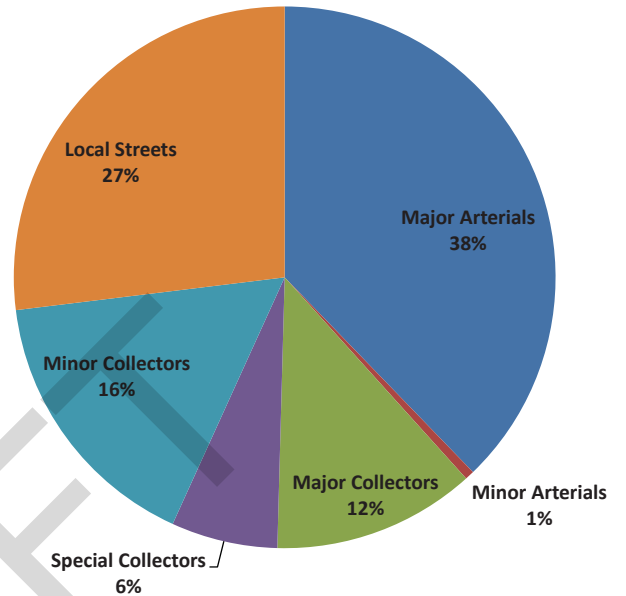
Operations and Maintenance (Recommended Cost Scenario)

Developer Impact

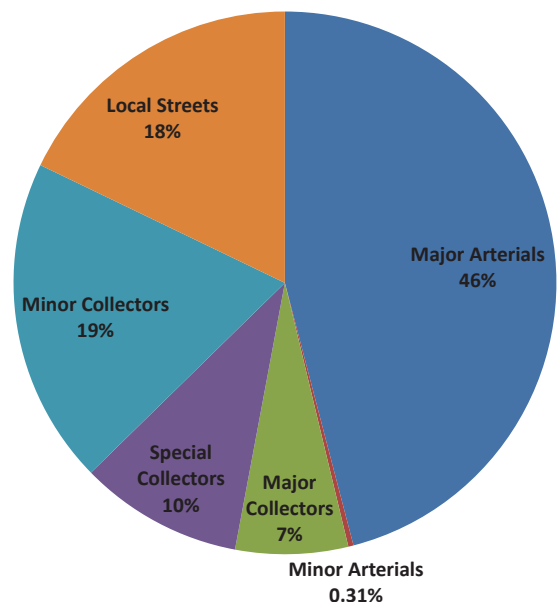
The road classification is an important consideration when reviewing anticipated developer contributions. Local roads are assumed to be fully developer funded while arterial and collector roads may have developer contributions, but are not guaranteed. For the purposes of the developer impact, only local roads will be considered.

For the seven intensification projects, major arterial roads represent the largest amount of streetscape construction at 38%. Local streets represent the second largest amount of streetscape work at 27% with collectors and minor arterials each representing less than 16%. It is reasonable that the largest portion of streetscape work is along major arterials given that best practices would agree that development for density is ideally connected to major transportation corridors. Major arterials are regionally owned and therefore have potential for regional funding.

Of interest to developers is the large amount of local streets. As the second largest amount of streetscape, developers will be responsible for at least approximately 1/3 of streetscape development. However, analysis of the road classification of the intensification projects by cost show that local streets only comprise of 18% of the total cost, at full build out, of the intensification projects.



Road Classification of Intensification Projects by Length

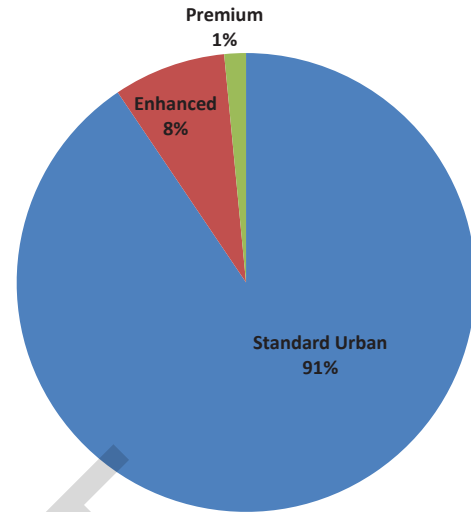


Road Classification of Intensification Projects by Cost

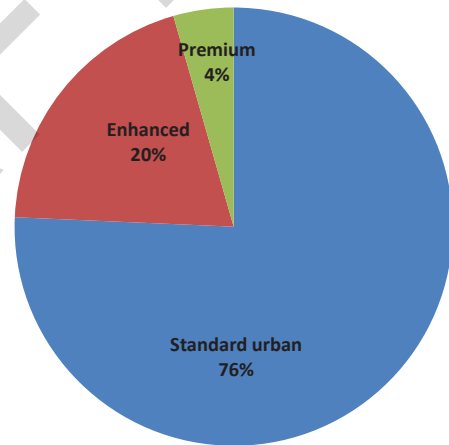
The lower cost impact of the local streets in comparison to the length is due to the level of service distribution along local streets. The Standard Urban level of service represents 91% of the local streets while Enhanced makes up 8% and Premium 1%. Therefore, since the vast majority of the local streets are of the lowest level of service, the cost impact is less than the collectors and arterials with a comparatively higher level of service.

The low, high and recommended cost scenarios for the Standard Urban level of service is most relevant with regards to developers. Given that such a high percentage of local roads are Standard Urban, it will be the level of service developers will be most responsible for in design and construction. At the recommended cost scenario, Standard Urban represents 76% of the cost of local roads, whereas Enhanced equal 20% and Premium 4%.

The low and high cost scenarios for the Standard Urban level of service show that there is a negligible difference between the low and recommended scenarios. The high cost scenario for the Standard Urban level of service increases the Standard Urban total cost by 1% in relation to Enhanced and Premium.



Level of Service Distribution of Local Streets by Length



Level of Service Distribution of Local Streets by Cost (Recommended Cost Standard Urban Scenario)

FORECAST

Upon full-build out, the total developer contribution potentially amounts to \$60,353,769. Total developer contribution is uncertain and largely affected by the market. Local roads are likely to be fully funded by developers with a total contribution of approximately \$32,149,268. The remaining \$28,204,501 for arterial and collector road construction may vary depending upon external factors.

Rate	10 Year Forecast										
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
B Developer Contribution (Local Roads)	467,663	614,448	614,448	614,448	614,448	2,247,486	2,520,816	2,520,816	2,520,816	2,520,816	1,362,725
D Potential Funding:											
Developer Contribution to Arterial/Collectors	796,939	1,047,074	1,047,074	1,047,074	1,122,949	1,950,013	1,978,259	1,963,451	1,963,451	2,007,471	1,318,611

Rate	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	B Developer Contribution (Local Roads)	1,037,760	1,037,760	1,037,760	1,037,760	1,731,241	1,668,540	1,668,540	1,668,540	2,277,831	588,288
D Potential Funding:											
Developer Contribution to Arterial/Collectors	962,068	916,550	916,550	1,617,389	1,270,537	1,202,308	1,202,308	1,202,308	869,493	448,475	448,475

Rate	2036	2037	TOTAL
	B Developer Contribution (Local Roads)	588,288	599,743
D Potential Funding:			-
Developer Contribution to Arterial/Collectors	448,475	457,198	28,204,501

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APPENDIX A

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Level of Service Prototypes Construction

Basic Level of Service Capital / Operating and Maintenance

CAPITAL

\$514.85 / lm

Amenity Zone

- Trees and Planters
 - Tree Deciduous 60mm Caliper
 - Planting Soil
 - Compacted Mulch
- Softscape
 - Sod

Pedestrian Clearway Zone

- Main Field
 - Poured In Place Concrete

Frontage Zone

- Softscape
 - Sod
 - Planting Bed

Illumination Elements

- Standard
 - Street Lighting

OPERATING AND MAINTENANCE

\$14.72 / lm / yr

Continuity Strip Zone

- Spring Cleanup
 - Salt Strip Sweeping

Amenity Zone

- Street Trees
 - Pruning
 - Mulching and Fertilization
 - Basic Root Pruning
- Softscape
 - Lawn Mowing

Pedestrian Clearway Zone

- Hardscape Concrete
 - Concrete Repairs
- Snow
 - Snow Removal

Frontage Zone

- Softscape
 - Shrub Bed Maintenance
 - Lawn Mowing

Illumination Elements

- Street Lighting

Standard Urban Level of Service Capital / Operating and Maintenance

CAPITAL

\$974.25 / lm

Continuity Strip Zone

Hardscape
 Poured In Place Concrete

Amenity Zone

Hardscape
 Poured In Place Concrete
Trees and Planters
 Tree Deciduous 60mm Caliper
 Planting Soil
 Raised Planter Curb
 Perennials and Ornamental Grasses

Pedestrian Clearway Zone

Main Field
 Poured In Place Concrete

Illumination Elements

Standard
 Street Lighting

OPERATING AND MAINTENANCE

\$99.70 / lm / yr

Continuity Strip Zone

Hardscape
 Concrete Repairs
Spring Cleanup
 Salt Strip Sweeping
Snow
 Snow Removal

Amenity Zone

Hardscape Concrete
 Concrete Repairs
Hardscape Planter Curb
 Concrete Repairs
Snow
 Snow Removal
Street Trees
 Pruning
 Watering
 Mulching
 Standard Root Pruning
 Infiltration / Irrigation / Flushing
Softscape
 Planter Watering / Maintenance
 Ground Cover Trash Removal / Maintenance

Pedestrian Clearway Zone

Hardscape Concrete
 Concrete Repairs
Snow
 Snow Removal

Illumination Elements

Street Lighting

Enhanced Level of Service Capital / Operating and Maintenance

CAPITAL

\$2,919.98 / lm

Continuity Strip Zone

Hardscape

Poured In Place Concrete

Amenity Zone

Hardscape

Pre-Cast Concrete Unit Pavers on Concrete Base

Trees and Planters

Tree Deciduous 80mm Caliper

Raised Planter Curb

Planting Soil

Perennials and Ornamental Grasses

Soil Cells

Furniture

Bench

Trash Receptacle

Bicycle Stand

Branding Signage

Pedestrian Clearway Zone

Main Field

Poured In Place Concrete

Frontage Zone

Hardscape

Poured In Place Concrete

Illumination Elements

Pedestrian Lighting

Street and Pedestrian Lighting

OPERATING AND MAINTENANCE

\$152.28 / lm / yr

Continuity Strip Zone

Hardscape

Concrete Repairs

Spring Cleanup

Salt Strip Sweeping

Snow

Snow Removal

Amenity Zone

Hardscape Unit Paving

Unit Paver Repairs

Concrete Base

Hardscape Planter Curb

Concrete Planter Repairs

Snow

Snow Removal

Street Trees

Pruning

Watering

Mulching and Fertilization

Infiltration / Irrigation / Flushing

Softscape

Planter Watering / Maintenance

Ground Cover Trash Removal / Maintenance

Trash Receptacle

Pedestrian Clearway Zone

Hardscape Concrete

Concrete Repairs

Snow

Snow Removal

Frontage Zone

Hardscape Concrete

Concrete Repairs

Illumination Elements

Typical Lighting

Pedestrian Lighting

Street / Pedestrian Combo Lighting

Premium Level of Service Capital / Operating and Maintenance

CAPITAL

\$3,389.50/ lm

Continuity Strip Zone

Hardscape

Poured In Place Concrete

Amenity Zone

Hardscape

Poured in Place Concrete

Natural Stone

Trees and Planters

Tree Deciduous 100mm Caliper

Raised Planter Curb

Planting Soil

Perennials and Ornamental Grasses

Soil Cells

Furniture

Bench

Trash Receptacle

Bicycle Stand

Branding Signage

Pedestrian Clearway Zone

Main Field

Pre-Cast Concrete Unit Pavers on Concrete Base

Paving Accent

Natural Stone

Frontage Zone

Hardscape

Poured In Place Concrete

Illumination Elements

Standard

Pedestrian Lighting

Street and Pedestrian Lighting

OPERATING AND MAINTENANCE

\$167.65 / lm / yr

Continuity Strip Zone

Hardscape

Concrete Repairs

Spring Cleanup

Salt Strip Sweeping

Snow

Snow Removal

Amenity Zone

Hardscape Unit Paving

Unit Paver Repairs

Concrete Base

Hardscape Planter Curb

Concrete Planter Repairs

Snow

Snow Removal

Street Trees

Pruning

Watering

Mulching and Fertilization

Infiltration / Irrigation / Flushing

Softscape

Trash Receptacle

Pedestrian Clearway Zone

Hardscape Unit Paving (Main Field)

Unit Paver Repairs

Concrete Base

Hardscape Unit Paving (Accent Field)

Unit Paver Repairs

Concrete Base

Snow

Snow Removal

Frontage Zone

Hardscape Concrete

Concrete Repairs

Illumination Elements

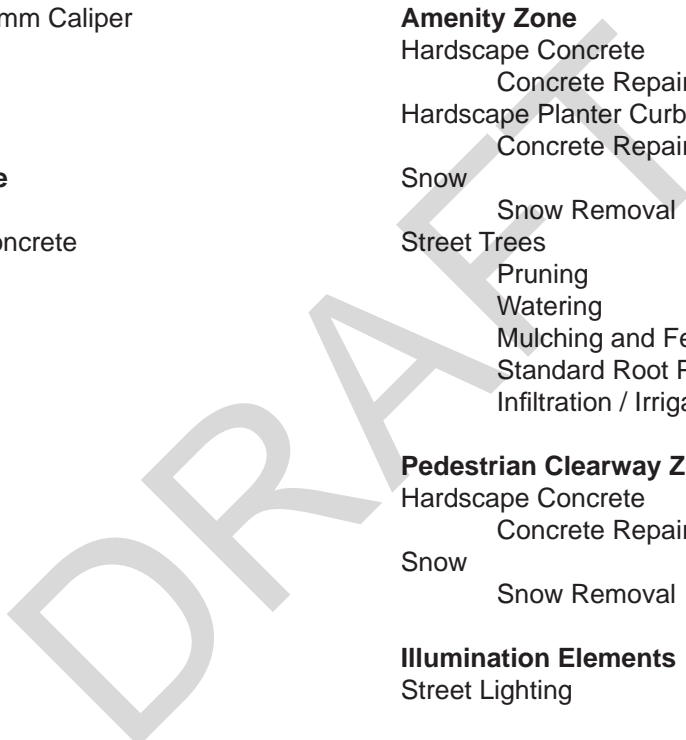
Typical Lighting

Pedestrian Lighting

Street / Pedestrian Combo Lighting

**Low Cost Scenario Standard Urban Level of Service
Capital / Operating and Maintenance**

<i>CAPITAL</i>	<i>\$966.25 / lm</i>	<i>OPERATING AND MAINTENANCE</i>	<i>\$84.53 / lm / yr</i>
Continuity Strip Zone		Continuity Strip Zone	
Hardscape		Hardscape	
Poured In Place Concrete		Concrete Repairs	
Amenity Zone		Spring Cleanup	
Hardscape		Salt Strip Sweeping	
Poured In Place Concrete		Snow	
Trees and Planters		Snow Removal	
Tree Deciduous 60mm Caliper		Amenity Zone	
Planting Soil		Hardscape Concrete	
Compacted Mulch		Concrete Repairs	
Tree Grate		Hardscape Planter Curb	
Pedestrian Clearway Zone		Concrete Repairs	
Main Field		Snow	
Poured In Place Concrete		Snow Removal	
Illumination Elements		Street Trees	
Standard		Pruning	
Street Lighting		Watering	
		Mulching and Fertilization	
		Standard Root Pruning	
		Infiltration / Irrigation / Flushing	
		Pedestrian Clearway Zone	
		Hardscape Concrete	
		Concrete Repairs	
		Snow	
		Snow Removal	
		Illumination Elements	
		Street Lighting	



**High Cost Scenario Standard Urban Level of Service
Capital / Operating and Maintenance**

CAPITAL

\$1,055.93 / lm

Street Lighting

Continuity Strip Zone

Hardscape

Poured In Place Concrete

Amenity Zone

Hardscape

Poured In Place Concrete

Trees and Planters

Tree Deciduous 60mm Caliper

Raised Planter Curb

Planting Soil

Perennials and Ornamental Grasses

Furniture

Bench

Trash Receptacle

Pedestrian Clearway Zone

Main Field

Poured In Place Concrete

Illumination Elements

Standard

OPERATING AND MAINTENANCE

\$115.70 / lm / yr

Continuity Strip Zone

Hardscape

Concrete Repairs

Spring Cleanup

Salt Strip Sweeping

Snow

Snow Removal

Amenity Zone

Hardscape Concrete

Concrete Repairs

Hardscape Planter Curb

Concrete Repairs

Snow

Snow Removal

Street Trees

Pruning

Watering

Mulching and Fertilization

Standard Root Pruning

Infiltration / Irrigation / Flushing

Softscape

Planter Watering / Maintenance

Ground Cover Trash Removal / Maintenance

Trash Receptacle

Pedestrian Clearway Zone

Hardscape Concrete

Concrete Repairs

Snow

Snow Removal

Illumination Elements

Street Lighting



APPENDIX B

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Region of York Top Performing Street Tree Species

Table B1: Top Performing Small Form (Hydro Acceptable) Species List

Species Name	Native ²	Characteristics
Shubert cherry (<i>Prunus virginiana</i> 'Shubert') ¹	Yes	<ul style="list-style-type: none"> • Very susceptible to black knot, requires annual pruning to control fungus • Prone to suckering from base of tree
Ivory silk lilac (<i>Syringa reticulata</i>)	No	<ul style="list-style-type: none"> • Showy lilac-like blooms in early summer, followed by seed capsules that persist on the tree • Fairly pest and disease resistant

Table B2: Top Performing Full Form Species List

Species Name	Native ²	Characteristics
Silver maple (<i>Acer saccharinum</i>) ¹	Yes	<ul style="list-style-type: none"> • Develops large crown, therefore plant in locations with adequate space
Ohio Buckeye (<i>Aesculus glabra</i>) ¹	Yes	<ul style="list-style-type: none"> • Showy flower spikes followed by seed husks covered in soft spines • Less susceptible to leaf scorch and leaf blotch than horsechestnut
Horsechestnut (<i>Aesculus hippocastanum</i>) ¹	No	<ul style="list-style-type: none"> • Showy flower spikes, less seed production than Ohio buckeye, seed husks covered in soft spines • Susceptible to leaf scorch and leaf blotch
Honeylocust (<i>Gleditsia triacanthos</i> var. <i>inermis</i>)	Yes	<ul style="list-style-type: none"> • Small leaves provide a filtered shade • Can be susceptible to defoliation by leafhoppers • Acceptable cultivars for Regional roads include: Shademaster
Kentucky coffee tree (<i>Gymnocladus dioicus</i>) ¹	Yes	<ul style="list-style-type: none"> • Coarse branching structure, large double-compound leaves with small leaflets • Dioecious tree with male and female plants, male tree preferred

Notes:

¹ Spring planting only

² A native tree is defined as a tree whose natural range is within Ontario and/or the northern U.S lake states.

APPENDIX C

DRAFT

Region of York Notable Street Tree Species for Select Planting Sites

Table C1: Notable Small Form (Hydro Acceptable) Species List

Species Name	Native ²	Characteristics
Hedge maple (<i>Acer campestre</i>)	No	<ul style="list-style-type: none"> Sensitive to desiccation from winter winds. Use in locations sheltered from prevailing winds.
Ornamental pear (<i>Pyrus calleryana</i>) ¹	No	<ul style="list-style-type: none"> Sensitive to desiccation from winter winds. Use in locations sheltered from prevailing winds. Acceptable cultivars for Regional roads include: Chanticleer Pear
Columnar Norway maple (<i>Acer platanoides</i> 'Columnare')	No Invasive	<ul style="list-style-type: none"> Species suitable for planting adjacent to overhead hydro due to its narrow width. Must be planted a minimum of five (5) metres from overhead hydro
English pyramidal oak (<i>Quercus robur</i> 'fastigiata') ¹	No	<ul style="list-style-type: none"> Species suitable for planting adjacent to overhead hydro due to its narrow width. Must be planted a minimum of five (5) metres from overhead hydro Should always be planted behind sidewalk / pedestrian zone

Notes:

¹ Spring planting only

² A native tree is defined as a tree whose natural range is within Ontario and/or the northern U.S lake states.

Table C2: Notable Full Form Species List

Species Name	Native ²	Characteristics
Norway maple (<i>Acer platanoides</i>)	No Invasive	<ul style="list-style-type: none"> Develops large crown, therefore plant in locations with adequate space. This species is invasive. Although some of the cultivars are less invasive, it is not to be planted near natural areas.
Autumn Blaze maple (<i>Acer x freemanii</i> 'Autumn Blaze') ¹	Yes	<ul style="list-style-type: none"> Sensitive to desiccation from winter winds. Use in locations sheltered from prevailing winds.
Hackberry (<i>Celtis occidentalis</i>) ¹	Yes	<ul style="list-style-type: none"> Sensitive to de-icing salts (airborne spray). Use in locations where exposure to salt spray will be minimized, e.g. wide boulevards (6 m +) on the north and west sides of roads.
Swamp white oak (<i>Quercus bicolor</i>) ¹	Yes	<ul style="list-style-type: none"> Of the oak species, this has shown the greatest tolerance to Regional road conditions. Still considered sensitive to de-icing salts (airborne spray). Use in locations where exposure to salt spray will be minimized, e.g. wide boulevards (6 m+) on the north and west sides of roads.
Bur oak (<i>Quercus macrocarpa</i>) ¹	Yes	<ul style="list-style-type: none"> Has shown tolerance to Regional road conditions. Still considered sensitive to de-icing salts (airborne spray). Use in locations where exposure to salt spray will be minimized, e.g. wide boulevards (6 m+) on north and west sides of roads.
Littleleaf linden (<i>Tilia cordata</i>)	No	<ul style="list-style-type: none"> Sensitive to desiccation from winter winds and de-icing salt. Plant in locations where exposure to salt spray will be minimized, e.g. wide boulevards (6 m+) on the north & west sides of roads and in a location sheltered from prevailing winds. Acceptable cultivars for Regional roads include: Glenleven and Greenspire.
Accolade elm (<i>Ulmus japonica</i> x <i>Ulmus wilsoniana</i>)	No	<ul style="list-style-type: none"> Initial plantings of this species have shown tolerance to the growing conditions on Regional road allowances. Experience with this species is limited and it should be used in limited quantities until further evaluation of its performance is completed.

Table C2: Notable Full Form Species List (Cont'd)

Species Name	Native ²	Characteristics
Colorado spruce (Picea pungens) ¹	No	<ul style="list-style-type: none"> • Sensitive to desiccation from winter winds and de-icing salt. Plant a minimum of 6 m from edge of road, and preferably in a sheltered location. • Should always be planted behind sidewalk / pedestrian zone. • Susceptible to yellow-headed spruce sawfly defoliation.
White spruce (Picea glauca) ¹	Yes	<ul style="list-style-type: none"> • More sensitive to desiccation from winter winds and de-icing salt than Colorado or Norway spruces. Plant a minimum of 6 m from edge of road, and preferably in a sheltered location. • Can be susceptible to yellow-headed spruce sawfly defoliation.
Norway spruce (Picea abies) ¹	No	<ul style="list-style-type: none"> • Sensitive to desiccation from winter winds and de-icing salt. Plant a minimum of 6 m from edge of road, and preferably in a sheltered location. • Should always be planted behind sidewalk / pedestrian zone. • Fairly pest and disease resistant.
Austrian pine (Pinus nigra) ¹	No	<ul style="list-style-type: none"> • Sensitive to desiccation from winter winds and de-icing salt. Plant a minimum of 6 m from edge of road, and preferably in a sheltered location. • Should always be planted behind sidewalk / pedestrian zone. • Susceptible to Diplodia, blight, select locations with good air flow and avoid mass plantings of this tree.

Notes:

¹ Spring planting only

² A native tree is defined as a tree whose natural range is within Ontario and/or the northern U.S lake states.

APPENDIX D

DRAFT

City of Vaughan Tree and Plant Species List

Table D1: Coniferous Trees (WB typical)

Species Name	Common Name	Size	Notes
<i>Abies alba</i>	Silver Fir	150 to 300cm ht.	
<i>Abies balsamea</i>	Balsam Fir	150 to 300cm ht.	
<i>Abies concolor</i>	White Fir	150 to 300cm ht.	
<i>Juniperus virginiana</i>	Eastern Red Cedar	150 to 300cm ht.	
<i>Larix laricina</i>	American Larch	150 to 300cm ht.	
<i>Picea abies</i>	Norway Spruce	150 to 300cm ht.	
<i>Picea glauca</i>	White Spruce	150 to 300cm ht.	
<i>Picea omorika</i>	Serbian Spruce	150 to 300cm ht.	
<i>Picea pungens</i>	Colorado Spruce	150 to 300cm ht.	(limit use due to Y.H. Sawfly)
<i>Picea pungens</i>	Colorado Blue Spruce	150 to 300cm ht.	(limit use due to Y.H. Sawfly)
<i>Picea pungens</i> 'Fat Albert'	Fat Albert Spruce	150 to 200cm ht.	
<i>Pinus nigra</i>	Austrian Pine	250cm ht.	(limit use due to Diploidia)
<i>Pinus resinosa</i>	Red Pine	175 to 300cm ht.	
<i>Pinus strobus</i>	Eastern White Pine	175 to 300cm ht.	
<i>Pinus sylvestris</i>	Scots Pine	200 to 300cm ht.	
<i>Pseudotsuga menziesii</i>	Douglas Fir	175 to 300cm ht.	
<i>Thuja occidentalis</i>	Eastern White Cedar	150 to 200cm ht.	
<i>Tsuga canadensis</i>	Eastern Hemlock	175 to 200cm ht.	limit to protected, moist loc.

Table D2: Deciduous Trees (60 mm cal WB typical)

Species Name	Common Name	Size	Notes
<i>Acer griseum</i>	Paperback Maple	50mm cal.	Sheltered location
<i>Acer platanoides</i> 'Columnar'	Columnar Maple	60mm cal. Typical	limit use
<i>Acer platanoides</i> 'Crimson King'	Crimson King Maple	60mm cal. Typical	limit use
<i>Acer platanoides</i> - 'Royal Red.'	Royal Red Maple	60mm cal. Typical	limit use
<i>Acer rubrum</i>	Red Maple	50 to 70mm cal.	avoid high pH, clay soils
<i>Acer rubrum</i> 'Autumn Spire'	Autumn Spire Maple	60mm cal. Typical	
<i>Acer rubrum</i> 'Karpick'	Karpick Maple	60mm cal. Typical	
<i>Acer rubrum</i> 'Red Sunset'	Red Sunset Maple	60mm cal. Typical	
<i>Acer saccharinum</i>	Silver Maple	60mm cal. Typical	
<i>Acer saccharum</i>	Sugar Maple	60mm cal. Typical	requires large root zone
<i>Acer spicatum</i>	Mountain Maple	200 cm ht.	
<i>Acer tataricum</i>	Tatarian Maple	60mm cal. Typical	
<i>Acer x freemanii</i>	Swamp Maple	60mm cal. Typical	avoid overplanting
<i>Acer x freemanii</i> 'Autumn Blaze'	Autumn Blaze Maple	60mm cal. Typical	
<i>Acer x freemanii</i> 'Firefall'	Firefall Maple	60mm cal. Typical	
<i>Acer x freemanii</i> 'Jeffersred'	Autumn Blaze Maple	60mm cal. Typical	
<i>Aesculus carnea</i> 'Briotii'	Red horse-chestnut	60mm cal. Typical	
<i>Aesculus glabra</i>	Ohio Buckeye	60mm cal. Typical	
<i>Aesculus hippocastanum</i>	Horse-chestnut	60mm cal. Typical	
<i>Aesculus hippocastanum</i> 'Baumannii'	Baumann's Horse Chestnut	60mm cal. Typical	
<i>Alnus incana</i> ssp. <i>Rugosa</i>	Speckled Alder	125cm ht.	
<i>Amelanchier canadensis</i>	Serviceberry	250cm ht. multi stem or 45 to 60mm cal	
<i>Amelanchier x grandiflora</i>	Serviceberry	45 to 60mm cal.	
<i>Amerlanchier arborea</i>	Downy Serviceberry	45 to 60mm cal.	

Table D2: Deciduous Trees (60 mm cal WB typical) (Cont'd)

Species Name	Common Name	Size	Notes
<i>Betula alleghaniensis</i>	Yellow Birch	50 to 60mm cal or could be multistem and by Ht. 250cm	
<i>Betula papyrifera</i>	Paper Birch	50 to 60mm cal	
<i>Carpinus betulus</i> 'fastigiata'	Pyramidal European Hornbeam	50 to 60mm cal	
<i>Carpinus caroliniana</i>	Blue Beech	50 to 60mm cal	
<i>Carya cordiformis</i>	Bitternut Hickory	or by 250cm ht.	
<i>Catalpa speciosa</i>	Northern Catalpa	60mm cal. Typical	
<i>Celtis occidentalis</i>	Hackberry	50 to 60mm cal	
<i>Cercidiphyllum japonicum</i>	Katsura	60mm cal. Typical	protected locations only
<i>Cercis canadensis</i>	Eastern Redbud	45 to 60mm cal	protected locations only
<i>Eucommia ulmoides</i>	Hardy rubber tree	60mm cal. Typical	
<i>Fagus grandiflora</i>	American Beech	60mm cal. Typical	
<i>Fagus sylvatica</i> "Dawyck Purple"	Dawyck Purple Beech	60mm cal. Typical	
<i>Ginkgo biloba</i>	Maidenhair Tree	60 to 70mm cal.	
<i>Gleditsia triacanthos inermis</i>	Thornless Honeylocust	60 to 80mm cal.	
<i>Gleditsia triacanthos inermis</i> 'Shademaster'	Shademaster Honeylocust	60 to 70mm cal.	
<i>Gleditsia triacanthos inermis</i> 'Skyline'	Skyline Honeylocust	60 to 70mm cal.	
<i>Gleditsia triacanthos</i> Var. <i>inermis</i> 'Ruby Lace'	Ruby Lace Honey Locust	60 to 70mm cal.	
<i>Gleditsia triacanthos</i> Var. <i>inermis</i> 'Suncole'	Suncole Honey Locust	60 to 70mm cal.	
<i>Gymnocladus dioica</i>	Kentucky Coffee Tree	60mm cal. Typical	
<i>Juglans nigra</i>	Black Walnut	60mm cal. Typical	
<i>Liriodendron tulipifera</i>	Tulip Tree	60mm cal. Typical	
<i>Malus</i> 'Royalty'	Royalty Crabapple	45 to 60mm cal	limit use
<i>Ostrya virginiana</i>	Ironwood/Hop Hornbeam	60mm cal. Typical	
<i>Plantanus occidentalis</i>	Sycamore	60mm cal. Typical	

Table D2: Deciduous Trees (60 mm cal WB typical) (Cont'd)

Species Name	Common Name	Size	Notes
Platanus acerfolia 'Bloodgood'	Bloodgood London Plane Tree	60mm cal. Typical	
Populus balsamifera	Balsam Poplar	45 to 60mm cal	
Populus nigra var Betulifolia 'Italica'	Lombardy Poplars	60mm cal. Typical	limit use
Populus grandidentata	Big-Toothed Aspen	60mm cal. Typical	
Populus tremuloides	Trembling Aspen	60mm cal. Typical	
Prunus serrulata 'Kwanzan'	Kwanzan Ornamental Cherry	45 to 60mm cal	
Pyrus calleryana 'Aristocrat'	Aristocrat Ornamental Pear	45 to 60mm cal	
Pyrus calleryana 'Chanticleer'	Chanticleer Pear	45 to 60mm cal	
Pyrus calleryana 'Glen's Form'	Glen's Form Ornamental Pear	45 to 60mm cal	
Pyrus calleryana 'Redspire'	Redspire Ornamental Pear	45 to 60mm cal	
Pyrus colleryano Capitol	Capitol Ornamental Pear	45 to 60mm cal	
Quercus alba	White Oak	60 to 70mm cal.	
Quercus bicolor	Swamp White Oak	60 to 70mm cal.	
Quercus macrocarpa	Bur Oak	60 to 70mm cal.	
Quercus palustris	Pin Oak	60 to 70mm cal.	avoid high pH, clay soils
Quercus robur	English Oak	60 to 70mm cal.	
Quercus robur 'Fastigiata'	Pyramidal English Oak	50 to 60mm cal.	
Quercus rubra	Red Oak	60 to 70mm cal.	
Salix alba 'Tristis'	Golden Weeping Willow	60mm cal. Typical	
Sorbus aucuparia	Mountain Ash	60mm cal. Typical	limit use- Fire blight
Syringa reticulota 'Ivory Silk'	Ivory Silk Tree Lilac	45 to 60mm cal	
Tilia americana	Basswood	60 to 80mm cal.	
Tilia americana 'Redmond'	Redmond Basswood	60mm cal. Typical	
Tilia cordata	Little Leaf Linden	60mm cal. Typical	
Tilia cordata 'Glenleven'	Glenleven Linden	60mm cal. Typical	
Tilia cordata 'Greenspire'	Greenspire Linden	60mm cal. Typical	
Ulmus americana cultivar 'Jefferson'	Jefferson Elm	60mm cal. Typical	
Ulmus 'pioneer'	Pioneer Elm	60mm cal. Typical	

Table D3: Shrubs (potted typical)

Species Name	Common Name	Size	Notes
Amelanchier arborea	Downy Serviceberry	3 gal pot to 200cm ht WB	
Amelanchier canadensis	Serviceberry	3 gal pot to 200cm ht WB	
Amelanchier laevis	Alleghany Serviceberry	3 gal pot to 200cm ht WB	
Amelanchier x alnifolia	Saskatoon Serviceberry	3 gal pot to 200cm ht WB	
Berberis thunbergii 'Rose Glow'	Rose Glow Barberry	50 cm	
Comus sericea	Red Osier Dogwood	100cm ht typical but ranges from live stakes up	
Cornus alba 'Elegantissima'	Silver Edge Dogwood	80 to 100 cm ht.	
Cornus alternifolia	Alternate-leaved Dogwood/ Pagoda	60 to 100cm ht.	
Cornus racemosa	Gray Dogwood	live stakes to 100cm ht.	
Euonymus elatus Coloratus	Dwarf Winged Burningq Bush	50cm ht	avoid over-planting
Euonymus fortunei	Winter creeper	50cm spr.	
Euonymus fortunei 'Sarcocoxie'	Sarcocoxie Euonymus	60cm spr.	
Fothergila major Mount Airy'	Mount Airy: Fothergilla	50cm spr.	
Hamamelis virginiana	Witch Hazel	3 gal. to 100cm ht.	
Hamamelis x intermedia 'Arnold's Promise'	Arnold's Promise Witch Hazel	3 gal. to 100cm ht.	
Hydrangea macrophylla 'Bicalmer'	Endless Summer Hydrangea	50cm	
Juniperus x media 'Old Gold'	Old Gold Juniper	40 to 60 cm spr.	
Juniperus chinensis "var. sargentii Viridis"	Green Sargent Juniper	40 to 60 cm spr.	
Juniperus sabina 'Tamariscifolia'	Tamarix Juniper	40 to 60 cm spr.	
Juniperus squamata 'Holger'	Holger Juniper	40 to 60 cm spr.	
Juniperus x media 'Old Gold'	Old Gold Juniper	40 to 60 cm spr.	
Lindera benzoin	Spicebush	50cm ht.	
Myrica gale	Sweet Gale	50cm ht.	

Table D3: Shrubs (potted typical) (Cont'd)

Species Name	Common Name	Size	Notes
Physocarpus opulifolius	Common Ninebark	80cm ht.	
Physocarpus opulifolius "Dart's Gold"	Darts Gold Ninebark	80cm ht.	
Pinus mugo 'Pumilia	Dwarf Mugho Pine	60cm spr.	
Potentilla fruticosa	Shrub Cinquefoil	50 to 60cm ht.	
Potentilla fruticosa 'Red Ace'	Red Ace Potentilla	50 to 60cm ht.	
Rhus aromatica	Fragrant Sumac	1 gal to 60cm ht	
Rhus typhina	Staghorn Sumac	80 cm spr.	
Ribes americanum	Wild Black Currant	50cm ht.	
Ribes aureum	Golden Currant	3 gal.	
Rosa woodsii	Woods Rose	40cm ht.	
Rubus odoratus	Flowering Raspberry	2 gal	
Salix bebbiana	Bebbs Willow	live stakes to 80cm ht.	
Salix discolor	Pussy Willow	live stakes to 80cm ht.	
Sambucus canadensis	American Elder	50 to 80cm ht. (2-3 gal typical)	
Spiraea alba	Meadowsweet	2 gal	
Spiraea bumalda "Anthony Waterer"	Anthony Waterer Spirea	2 gal to 60 cm ht.	
Spiraea japonica 'Little Princess'	Little Princess Spirea	2 gal to 60 cm ht.	
Spiraea nipponica 'Snowmound'	Snowmound Spirea	2 gal to 60 cm ht.	
Spirea japonica 'Goldflame'	Spirea Goldflame	2 gal to 60 cm ht.	
Symphoricarpos albus	Snowberry	2 gal to 60 cm ht.	
Syringa reticulata	Common Lilac (3 gal. pot)	3 gal	
Taxus x media 'Citation'	Citation Yew	50cm ht	well drained areas only
Viburnum lentago	Nannyberry	60 to 80 cm ht.	

Table D4: Perennials			
(1 gal typical except in the case of naturalization and for larger impact use of 2 gal)			
Species Name	Common Name	Size	Notes
Acorus gramineus 'Oborozuki'	Sweet Flag	4" pot to 1 gal	
Allium aflatunense	Flowering Onion BULB	blub or potted depending on season	
Asclepias incarnata	Swamp Milkweed	4" pot to 1 gal	
Aster cordifolius	Heart-Leaved Aster	4" pot to 1 gal	
Aster Novae-angliae	New England Aster	4" pot to 1 gal	
Bouteloua gracilis	Mosquito Grass	4" pot to 1 gal	
Calamagrostis acutiflora	Feather Reed Grass	1 gal typical	
Calamagrostis acutiflora 'Karl Foerster'	Karl Foerster Feather Reed Grass	1 gal typical	
Calamagrostis brachytricha	Korean Feather Reed Grass	1 gal typical	
Calamagrostis canadensis	Canada Bluejoint Grass	1 gal typical	
Calamagrostis x acutiflora 'Overdam'	Variiegated Reed Grass	1 gal typical	
Calamagrostis x acutifolia 'Karl Foerster'	Feather Reed Grass	1 gal typical	
Calamoqrostis x ocutifolio Stricto'	Feather Reed Grass	1 gal typical	
Campanula carpatica	Carpathian bellflower	4" pot to 1 gal	
Carex greyi	Morning Star Sedge	4" pot to 1 gal	
Carex muskingumensis	Palm Sedge Grass	4" pot to 1 gal	
Carex pensylvanica	Pennsylvania Sedge	4" pot to 1 gal	
Carex stricta	Tussock Sedge	4" pot to 1 gal	
Carex vulpinoidea	Fox Sedge	4" pot to 1 gal	
Deschampsia cespitosa	Tufted Hair Grass	1 gal typical	
Echinachea or Rudbeckia	Little Angel Coneflower	1 gal typical	
Eupatorium	Spotted Joe Pye Weed	4" pot to 1 gal	
Eupatorium maculatum	Joe Pye Weed	4" pot to 1 gal	
Festuca cinerea "Elijah Blue"	Elijah Blue fescue	1 gal typical	
Festuca glauca 'Boulder Blue"	Boulder Blue Fescue	1 gal typical	
Geranium maculatum	Wood Geranium	4" pot to 1 gal	
Glyceria Striata / Fowl Manna Grass	Fowl Manna Grass	4" pot to 1 gal	

Table D4: Perennials (Cont'd) (1 gal typical except in the case of naturalization and for larger impact use of 2 gal)			
Species Name	Common Name	Size	Notes
Helictotrichon "Sapphire"	Sapphire Blue Oat Grass	1 gal typical	
Hemerocallis	Daylily	1 gal typical	
Hemerocallis 'Magnificent Rainbow'	Magnificent Rainbow Daylily	1 gal typical	
Hemerocallis 'Stella D'Oro'	Stella D'oro Daylily	1 gal typical	
Hemerocallis 'fulva'	Tawny Daylily	1 gal typical	
Hosta 'Hadspen Blue'	Hadspen Blue Hosta	1 gal typical	
Hosta 'Sum and Substance'	Sum and Substance Hosta	1 gal typical	
Hypericum ascyron	Great St.John's Wort	1 gal typical	
Imperata cylindrical 'Red Baron'	Japanese Blood Grass	1 gal typical	use with caution
Iris versicolor	Blue Flag Iris	4" pot to 1 gal	
Lavandula angustifolia 'Munstead strain'	Munstead Lavender	1 gal typical	use with caution
Liatris spicata	Dense Blazing Star	1 gal typical	
Lilium michiganense	Michigan Lily	4" pot	
Lobelia siphilitica	Blue Cardinal Flower	1 gal typical	
Matteucia struthiopteris	Ostrich Fern	1 gal typical	
Miscanthus sinensis 'pupurascens'	Flame Grass	1 gal typical	
Miscanthus sinensis 'Gracillimus'	Maiden grass	1 gal typical	
Monarda fistulosa	Wild Bee Balm	1 gal typical	use with caution- powdery mildew
Onoclea sensibilis	Sensitive Fern	1 gal typical	
Panicum virgatum	Switch Grass	1 gal typical	
Panicum virgatum 'Cloud Nine'	Cloud Nine Switch Grass	1 gal typical	
Panicum virgatum var	Red Switch Grass	1 gal typical	
Pennisetum alopecuroides	Fountain Grass	1 gal typical	
Perovskia atriplicifolia	Russian Sage	1 gal typical	
Festuca glauca 'Boulder Blue'	Boulder Blue Fescue	1 gal typical	
Perovskia atriplicifolia 'Little Spire'	Little Spire Russian Sage	1 gal typical	
Ratibida pinnata	Grey-headed Coneflower	1 gal typical	

Table D4: Perennials (Cont'd) (1 gal typical except in the case of naturalization and for larger impact use of 2 gal)			
Species Name	Common Name	Size	Notes
Rudbeckia fulgida 'Goldsturm'	Goldstrum Black Eyed Susan Coneflower	1 gal typical	
Rudbeckia hirta	Black Eyed Susan	1 gal typical	
Sagittaria latifolia	Common Arrowhead	plug or 4" pot	
Salvia verticillata 'Purple Rain'	Purple Rain Salvia	1 gal typical	
Schizachyrium (or Andropogon) scoparium	Little Bluestem	1 gal typical	
Scirpus validus	Soft-stemmed Bullrush	plug or 4" pot	
Sedum kamitschaticum	Russian Stonecrop	4" pot to 1 gal	
Sedum x 'Autumn Joy'	Autumn Joy Sedum	1 gal typical	
Solidago rigida	Stiff Goldenrod	plug or 4" pot	
Sparganium emersum	Green Bur-reed	plug or 4" pot	
Typha latifolia	Cattail	plug or 4" pot	
Verbena hastata	Blue Vervain	4" pot	
Vinca minor	Periwinkle	4" pot	
Viola sororia	Common Blue Violet	4" pot	

APPENDIX E

DRAFT

Salt and Drought Tolerant Species List

Table E1: Large Deciduous Trees (Salt and Drought Tolerant)

Species Name	Common Name	Native	Notes
<i>Ailanthus altissima</i>	Tree of Heaven	no	Male clone
<i>Carya cordiformis</i>	Bitternut Hickory	yes	
<i>Catalpa speciosa</i>	Northern Catalpa	no	
<i>Corylus colurna</i>	Turkish Hazel	no	
<i>Eucommia ulmoides</i>	Hardy Rubber Tree	no	
<i>Ginkgo biloba</i>	Maidenhair Tree	no	
<i>Gleditsia triacanthos</i>	Honey Locust	no	
<i>Gymnocladus dioica</i>	Kentucky Coffeetree	yes	
<i>Juglans cinerea</i>	Butternut	yes	
<i>Juglans nigra</i>	Black Walnut	yes	
<i>Platanus occidentalis</i>	Sycamore	yes	
<i>Platanus x acerfolia</i>	London Plane Tree	no	
<i>Prunus serotina</i>	Black Cherry	yes	
<i>Quercus acutissima</i>	Sawtooth Oak	no	
<i>Quercus alba</i>	White Oak	yes	
<i>Quercus macrocarpa</i>	Bur Oak	yes	
<i>Quercus palustris</i>	Pin Oak	yes	
<i>Quercus robur</i>	English Oak	no	
<i>Quercus rubra</i>	Red Oak	yes	<i>Quercus rubra</i> (Northern Red Oak) may also be used
<i>Salix amygdaloides</i>	Peachleaf Willow	yes	
<i>Tilia cordata</i>	Little Leaf Linden	yes	
<i>Zelkova serrata</i>	Japanese Zelkova	no	

Table E2: Shrubs for Roadside Planting (Salt and Drought Tolerant)

Species Name	Common Name	Native	Notes
<i>Amelanchier laevis</i>	Allegheny Serviceberry	yes	
<i>A. sanguinea</i>	Dwarf Juneberry	yes	
<i>A. spicata</i>	Shadbush Serviceberry	yes	
<i>A. x alnifolia</i>	Saskatoon Serviceberry	yes	
<i>Aronia melanocarpa</i>	Black Chokeberry	yes	
<i>Buxus</i>	Boxwood	no	
<i>Cephalanthus occidentalis</i>	Buttonbush	yes	
<i>Cornus foemina</i>	Gray Dogwood	yes	
<i>Cotoneaster</i>	Cotoneaster	no	
<i>Forsythia intermedia</i>	Forsythia	no	
<i>Hypericum kalmianum</i>	Shrubby St. Johns- Wort	yes	
<i>Juniperus communis</i>	Common Juniper	yes	
<i>Juniperus horizontalis</i>	Creeping Juniper	yes	
<i>Lindera benzoin</i>	Spicebush	yes	
<i>Mahonia aquifolium</i>	Oregon Grape	no	
<i>Myrica pensylvanica</i>	Bayberry	yes	
<i>Physocarpus opulifolius</i>	Eastern Ninebark	yes	
<i>Pinus mugo</i>	Mugo Pine	no	
<i>Potentilla fruticosa</i>	Shrubby Cinquefoil	yes	
<i>Prunus x cistena</i>	Purple-Leaf Sandcherry	no	
<i>Prunus pennsylvanica</i>	Pin Cherry	yes	
<i>Prunus pumila</i>	Sand Cherry	yes	
<i>Prunus virginiana</i>	Chokecherry	yes	
<i>Rhus aromatica</i>	Fragrant Sumac	yes	
<i>Rhus glabra</i>	Smooth Sumac	yes	
<i>Rhus typhina</i>	Staghorn Sumac	yes	
<i>Ribes alpinum</i>	Alpine Currant	no	
<i>Rosa rugosa</i>	Japanese Rose	no	Invasive, do not use within 100m of a natural area or Blue Street
<i>Rubus idaeus</i>	Red Raspberry	yes	
<i>Rubus odoratus</i>	Purple Flowering Raspberry	yes	

Table E3: Shrubs for Roadside Planting (Salt and Drought Tolerant) (Cont'd)

Species Name	Common Name	Native	Notes
<i>Salix discolor</i>	Pussy Willow	yes	
<i>Salix exigua</i>	Sandbar Willow	yes	
<i>Sambucus canadensis</i>	Elderberry	yes	
<i>Sambucus racemosa</i>	Red Elderberry	yes	
<i>Shepherdia canadensis</i>	Buffaloberry	yes	
<i>Spiraea japonica</i>	Japanese Spiraea	no	
<i>Symphoricarpos alba</i>	Western Snowberry	no	Invasive, do not use within 100m of a natural area or Blue Street
<i>Viburnum dentatum</i>	Arrowwood	yes	
<i>Viburnum rafinesquianum</i>	Downy Arrowwood	yes	

Table E4: Groundcovers for Roadside Planting (Salt and Drought Tolerant)

Species Name	Common Name	Native	Notes
<i>Ajuga</i>	Bugleweed	no	Invasive, do not use within 100m of a natural area or Blue Street
<i>Antennaria</i> spp.	Pussytoes	yes	
<i>Arctostaphylos uva-ursi</i>	Bearberry	yes	
<i>Cerastium arvense</i> ssp. <i>strictum</i>	Field Chickweed	yes	
<i>Cerastium tomentosum</i>	Snow-in-Summer	yes	
<i>Fragaria virginiana</i> ssp. <i>virginiana</i>	Common Strawberry	yes	
<i>Thymus serpyllum</i>	Mother-of-Thyme	no	Invasive, do not use within 100m of a natural area or Blue Street
<i>Waldsteinia fragarioides</i>	Barren Strawberry	yes	

Table E5: Perennials for Roadside Planting (Salt and Drought Tolerant)

Species Name	Common Name	Native	Notes
<i>Achillea millefolium</i>	Common Yarrow	yes	
Agastache 'Black Adder'	Black Adder Hyssop	no	
Agastache rupestris	Orange Flare Hyssop	no	
<i>Alchemilla mollis</i>	Lady's Mantle	no	
<i>Aquilegia canadensis</i>	Wild Columbine	yes	
<i>Armeria maritima</i>	Sea Thrift	no	
<i>Artemisia schmidtiana</i>	Artemesia	no	
<i>Asclepias incarnata</i>	Swamp Milkweed	yes	
<i>Asclepias tuberosa</i>	Butterfly Milkweed	yes	
<i>Baptisia alba</i>	White Wild Indigo	no	
<i>Baptisia australis</i>	False Indigo	no	
<i>Bergenia</i>	Bergenia	no	
<i>Boltonia asteroides</i>	Boltonia, False Aster	no	
<i>Brunerra macrophylla</i>	Siberian Bugloss	no	
<i>Coreopsis lanceolata</i>	Lance-leaved Coreopsis	yes	
<i>Coreopsis rosea</i>	Pink-flowered Tickseed	no	
<i>Echinacea purpurea</i>	Eastern Purple Coneflower	no	
<i>Epilobium coloratum</i>	Purple-leaf Willow-herb	yes	
<i>Epimedium</i>	Barrenwort	no	
<i>Erigeron pulchellus</i>	Robin's Plantain Fleabane	yes	
<i>Eupatorium maculatum</i>	Joe Pye Weed	yes	
<i>Euthamia graminifolia</i>	Flat-top Goldentop	yes	
<i>Gaillardia aristata</i>	Great Blanket-flower	no	
Geranium 'Rozeanne'	Rozeanne Geranium	no	
<i>Geum triflorum</i>	Prairie Smoke	yes	
<i>Helianthus divaricatus</i>	Woodland Sunflower	yes	
<i>Helianthus strumosus</i>	Pale-leaf Sunflower	yes	
<i>Helianthus tuberosus</i>	Jerusalem Artichoke	yes	
<i>Heuchera 'Marmalade'</i>	Coralbells	no	
<i>Iberis sempervirens</i>	Candytuft	no	
<i>Lavandula angustifolia</i>	Lavender	no	

Table E6: Perennials for Roadside Planting (Salt and Drought Tolerant) (Cont'd)

Species Name	Common Name	Native	Notes
<i>Lespedeza capitata</i>	Round-head Bush-clover	yes	
<i>Leucanthemum</i>	Shasta Daisy	no	
<i>Lysimachia ciliata</i>	Fringed Loosestrife	yes	
<i>Monarda fistulosa</i>	Wild Bergamot, Bee-balm	yes	
<i>Nepeta racemosa</i>	Catmint	no	
<i>Opuntia fragilis</i>	Spreading Prickly-Pear	yes	
<i>Packera paupercula</i>	Balsam Ragwort	yes	
<i>Penstemon digitalis</i>	Foxglove, Beardtongue	yes	
<i>Potentilla anserina</i>	Silverweed	yes	
<i>Rudbeckia hirta</i>	Black-Eyed Susan	yes	
<i>Rudbeckia laciniata</i>	Green-Headed or Cut-leaf Coneflower	yes	
<i>Sedum spectabile</i>	Sedum	no	
<i>Sisyrinchium montanum</i>	Strict Blue-eyed-grass	yes	
<i>Solidago altissima</i>	Tall Goldenrod	yes	
<i>Solidago canadensis</i>	Canada Goldenrod	yes	
<i>Solidago flexicaulis</i>	Zig-zag Goldenrod	yes	
<i>Solidago nemoralis</i>	Grey Goldenrod	yes	
<i>Stachys byzantina</i>	Lambs' Ears	no	
<i>Symphotrichum cordifolium</i>	Heart-leaved Aster	yes	
<i>S. ericoides</i>	White Heath Aster	yes	
<i>S. lanceolatum</i>	Panicled Aster	yes	
<i>S. novae-angliae</i>	New England Aster	yes	
<i>S. oolentangiense</i>	Sky-blue Aster	yes	
<i>Thalictrum pubescens</i>	Tall Meadow-Rue	yes	
<i>Trichostema brachiatum</i>	False Pennyroyal	yes	
<i>Verbena stricta</i>	Hoary Vervain	yes	
<i>Verbena urticifolia</i>	White Vervain	yes	
<i>Veronicastrum virginicum</i>	Culver's-root	yes	
<i>Yucca filamentosa</i>	Narrow-Leaved Yucca	no	
<i>Zizia aurea</i>	Common Alexanders	yes	

Table E7: Grasses and Sedges for Roadside Planting (Salt and Drought Tolerant)

Species Name	Common Name	Native	Notes
<i>Andropogon gerardii</i>	Big Bluestem	yes	
<i>Bromus latiglumis</i>	Broad-glumed Brome	yes	
<i>Calamagrostis acutiflora</i> 'Karl Foerster'	Karl Foerster Feather Reed Grass	no	
<i>Carex atherodes</i>	Awned Sedge	yes	
<i>Carex brevior</i>	Brevior Sedge	yes	
<i>Carex pennsylvanica</i>	Pennsylvania Sedge	yes	
<i>Chasmanthium latifolium</i>	Northern Sea Oats	yes	
<i>Danthonia spicata</i>	Poverty Oatgrass	yes	
<i>Deschampsia caespitosa</i>	Tufted Hair Grass	yes	
<i>Elymus canadensis</i>	Canada Wild-rye	yes	
<i>Elymus riparius</i>	River Wild-rye	yes	
<i>Elymus virginicus</i>	Virginia Wild-rye	yes	
<i>Festuca cinerea</i> "Elijah Blue"	Elijah Blue Fescue	no	
<i>Festuca glauca</i> 'Boulder Blue'	Boulder Blue Fescue	no	
<i>Festuca ovina</i> 'Elijah Blue'	Elijah Blue Fescue	no	
<i>Helictotrichon sempervirens</i>	Blue Oat Grass	no	
<i>Juncus tenuis</i>	Path Rush	yes	
<i>Miscanthus sinensis</i> 'Gracillimus'	Maiden grass	no	Invasive, do not use within 100m of a natural area or Blue Street
<i>Miscanthus sinensis</i> 'pupura-scens'	Flame Grass	no	Invasive, do not use within 100m of a natural area or Blue Street
<i>Miscanthus sinensis</i>	Morning Light	no	
'Morning Light'	Maiden Grass	no	Invasive, do not use within 100m of a natural area or Blue Street
<i>Muhlenbergia mexicana</i>	Mexican Muhly	yes	
<i>Schizachyrium scoparium</i>	Little Bluestem	yes	
<i>Scirpus cyperinus</i>	Cottongrass Bulrush	yes	
<i>Sorghastrum nutans</i>	Yellow Indian-grass	yes	
<i>Spartina pectinata</i>	Prairie Cordgrass	yes	
<i>Sporobolus neglectus</i>	Small Dropseed	yes	

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APPENDIX F

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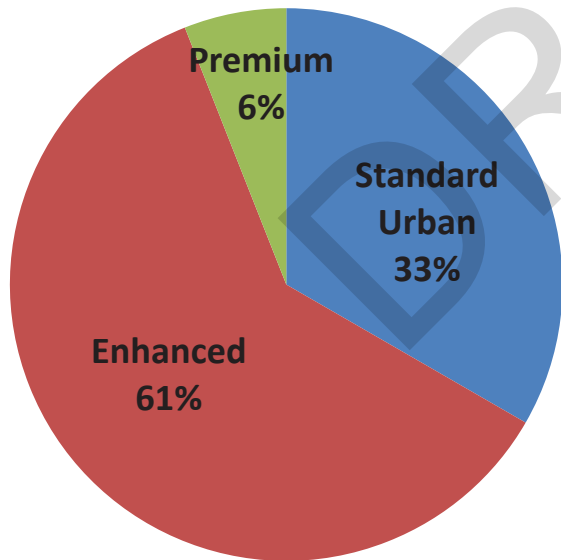
Low Cost Standard Urban Scenario

	2013	10 Year Forecast										TOTAL
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Total Capital Cost	\$0	\$5,038,285	\$8,207,794	\$8,706,264	\$8,706,264	\$9,376,084	\$10,259,938	\$9,323,484	\$9,158,592	\$9,158,592	\$12,825,773	\$90,761,069
Secured Funding:												
Development Charges	\$0	\$751,845	\$1,082,247	\$1,111,882	\$1,111,882	\$1,168,850	\$860,868	\$667,793	\$653,769	\$653,769	\$949,183	\$9,012,088
Region of York - Approved Funding	\$0	\$522,059	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$522,059
Developer Contribution (Local Roads)	\$0	\$466,549	\$612,984	\$612,984	\$612,984	\$612,984	\$2,236,709	\$2,508,252	\$2,508,252	\$2,508,252	\$2,508,252	\$15,188,202
Potential Funding:												
Developer Contribution to Arterial/Major Collectors	\$0	\$794,294	\$1,043,598	\$1,043,598	\$1,043,598	\$1,118,791	\$1,945,935	\$1,974,926	\$1,960,248	\$1,960,248	\$2,004,268	\$14,889,505
Region of York - Eligible (50% MSPP, 33% Other)	\$0	\$266,136	\$1,543,005	\$1,880,904	\$1,880,904	\$2,058,332	\$1,429,305	\$1,077,818	\$1,032,875	\$1,032,875	\$2,052,532	\$14,254,687
Best Case Vaughan Financial Commitment	\$0	\$2,237,401	\$3,925,960	\$4,056,896	\$4,056,896	\$4,417,127	\$3,787,121	\$3,094,695	\$3,003,448	\$3,003,448	\$5,311,537	\$36,894,528
Best Case Tax Percentage Impact	0.00%	1.43%	2.38%	2.24%	2.08%	2.22%	1.87%	1.49%	1.42%	1.39%	1.39%	18.95%
Worst Case Vaughan Financial Commitment	\$0	\$3,297,832	\$6,512,563	\$6,981,398	\$6,981,398	\$7,594,250	\$7,162,361	\$6,147,439	\$5,996,571	\$5,996,571	\$9,368,338	\$66,038,720
Worst Case Tax Percentage Impact	0.00%	2.11%	3.95%	3.86%	3.58%	3.82%	3.53%	2.97%	2.84%	2.78%	4.26%	33.70%

Secured vs. Potential Funding (Low Cost Scenario)

	2013	10 Year Forecast										TOTAL
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Operating and Maintenance Cost	\$0	\$257,704	\$415,752	\$439,971	\$439,971	\$488,802	\$548,524	\$491,793	\$479,772	\$479,772	\$700,876	\$4,742,937
Tax Percentage Increase	0.00%	0.16%	0.25%	0.24%	0.23%	0.25%	0.27%	0.24%	0.23%	0.22%	0.32%	2.41%
Infrastructure Replacement Reserve Contribution	\$0	\$251,914	\$410,390	\$435,313	\$435,313	\$468,804	\$512,997	\$466,174	\$457,930	\$457,930	\$641,289	\$4,538,053
Tax Percentage Increase	0.00%	0.16%	0.25%	0.24%	0.22%	0.24%	0.25%	0.23%	0.22%	0.21%	0.29%	2.31%

Operations and Maintenance (Low Cost Scenario)



Level of Service Distribution by Cost (Low Cost Scenario)

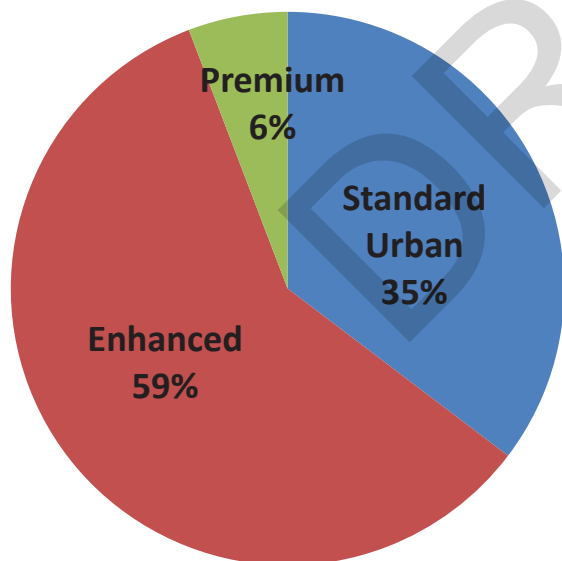
High Cost Standard Urban Scenario

	2013	10 Year Forecast										TOTAL
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Total Capital Cost	\$0	\$5,166,690	\$8,402,166	\$8,908,692	\$8,908,692	\$9,640,683	\$10,585,506	\$9,596,469	\$9,416,280	\$9,416,280	\$13,278,093	\$93,319,551
Secured Funding:												
Development Charges	\$0	\$751,843	\$1,082,245	\$1,111,881	\$1,111,881	\$1,168,850	\$860,876	\$667,792	\$653,769	\$653,769	\$949,186	\$9,012,092
Region of York - Approved Funding	\$0	\$522,059	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$522,059
Developer Contribution (Local Roads)	\$0	\$478,961	\$629,292	\$629,292	\$629,292	\$629,292	\$2,357,888	\$2,648,952	\$2,648,952	\$2,648,952	\$2,648,952	\$15,949,825
Potential Funding:												
Developer Contribution to Arterial/Major Collectors	\$0	\$823,960	\$1,082,575	\$1,082,575	\$1,082,575	\$1,165,396	\$1,991,550	\$2,012,290	\$1,996,124	\$1,996,124	\$2,040,144	\$15,273,313
Region of York - Eligible (50% MSPP, 33% Other)	\$0	\$266,136	\$1,555,837	\$1,897,764	\$1,897,764	\$2,093,191	\$1,469,814	\$1,104,470	\$1,054,970	\$1,054,970	\$2,133,430	\$14,528,347
Best Case Vaughan Financial Commitment	\$0	\$2,323,731	\$4,052,217	\$4,187,180	\$4,187,180	\$4,583,954	\$3,905,378	\$3,162,965	\$3,062,466	\$3,062,466	\$5,506,381	\$38,033,916
Best Case Tax Percentage Impact	0.00%	1.49%	2.46%	2.31%	2.15%	2.30%	1.92%	1.53%	1.45%	1.42%	2.51%	19.54%
Worst Case Vaughan Financial Commitment	\$0	\$3,413,827	\$6,690,629	\$7,167,519	\$7,167,519	\$7,842,541	\$7,366,742	\$6,279,725	\$6,113,559	\$6,113,559	\$9,679,955	\$67,835,575
Worst Case Tax Percentage Impact	0.00%	2.18%	4.06%	3.96%	3.67%	3.94%	3.63%	3.03%	2.90%	2.84%	4.41%	34.62%

Secured vs. Potential Funding (Low Cost Scenario)

	2013	10 Year Forecast										TOTAL
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Operating and Maintenance Cost	\$0	\$294,899	\$472,052	\$498,605	\$498,606	\$565,445	\$642,808	\$570,861	\$554,410	\$554,409	\$831,879	\$5,483,974
Tax Percentage Increase	0.00%	0.19%	0.29%	0.28%	0.26%	0.28%	0.32%	0.28%	0.26%	0.26%	0.38%	2.78%
Infrastructure Replacement Reserve Contribution	\$0	\$258,335	\$420,107	\$445,434	\$445,434	\$482,034	\$529,275	\$479,823	\$470,814	\$470,814	\$663,905	\$4,665,972
Tax Percentage Increase	0.00%	0.17%	0.26%	0.25%	0.23%	0.24%	0.26%	0.23%	0.22%	0.22%	0.30%	2.37%

Operations and Maintenance (Low Cost Scenario)



Level of Service Distribution by Cost (High Cost Scenario)

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APPENDIX G

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City Decision Making Matrix

PLANNING STAGE	QUESTION OF...	CITY DECISION POINTS	SIMPLIFIED YES / NO BASED UPON...	CRITERIA
Master Planning Level	Commitment	Master Plan Identification	Is this worth our Investment?	<ul style="list-style-type: none"> - Is there a potential return on investment? - Is it in line with the Official Plan? - Will it help the growth / development of the municipality? - Is the master plan in an identified intensification area of the Official Plan? - Is the master plan in an area with a high potential for future densification and development? - Does the master plan aid in increasing densification to support public transit? - Does the master plan respond to transportation initiatives outlined by regional / provincial plans? - Will the master plan potentially contribute to the economic prosperity of local businesses through: <ul style="list-style-type: none"> - Growth in pedestrian traffic - Growth in retail sales - Achievable rents - Increased area demand - Growth in assessment - Enhanced value of surrounding lands - Will the master plan potentially contribute to the residential desirability of the area through: <ul style="list-style-type: none"> - Increased area demand - Growth in assessment - Enhanced value of surrounding lands - Raised quality of life - Quality of place and city building
	Affordability	Master Plan Financial Commitments Funding and Negotiations	Can we <u>potentially</u> afford it now and in the future? Will others help us and how much?	<ul style="list-style-type: none"> - Is the design appropriate for the purpose and vision of the area? - Is the municipality willing to commit the capital funds necessary to achieve the appropriate level of service? - Given the expected growth in the area, will the municipality potentially be able to afford the future financial commitments? - What are the positive / negative impacts of increasing / lowering the level of service? - Do the positive / negative impacts of increasing / lowering the level of service proposed compromise the design needs? - Who are the potential funding partners? <ul style="list-style-type: none"> - Regional - Developers - Federal and Provincial Programs - Municipal - What programs are available to aid in the capital funding of the project? - What organizations are willing to partner with the municipality to fund the capital cost to complete the project? - Can we negotiate with the various funding partners for more funds? - Given the available funding, can the municipality afford to fund the difference? - Will the future densification be able to afford the on-going operations and maintenance?
Project Planning Level	Logistics	Project Details	Can we <u>realistically</u> afford the project? Is the project still what we envisioned?	<ul style="list-style-type: none"> - Is the detailed design of the project faithful to the intent of the master plan? - Are the objective sof the master plan met by the detailed design? - Does the detailed design reveal any new concerns not previously known in the master plan? <ul style="list-style-type: none"> - Are the new issues adequately addressed in the detailed design? - Do the new issues add significant capital and future cost to the project? - Are the additional costs to address the issues unavoidable? - Can the municipality afford the new costs? - Does the detaile design add new features to the project? <ul style="list-style-type: none"> - Do the new features add any benefits to the municipality and residents? - Do the new features add significant capital and future cost to the project? - Do the benefits justify the increased costs? - Can the municipality afford the new costs? - Given the detailed costing, is the project still realistically affordable? - Can the project be implemented in the phasing proposed with minimal disruption to the businesses and residents? - Is there benefit to increasing / decreasing the overall timeline of the project?
Value Engineering Level	Value / Efficiency	Value Engineering	Can we get the best value for our investment?	<ul style="list-style-type: none"> - Is the detailed design cost effective? - Are there alternative construction details which could be of more efficient construction? - Are there alternative manufactureres whose products perform comparably but are more cost effective? - Are there any design elements which could be eliminated or modified without compromising the overall design intent?
Implementation Level	Satisfaction	Proceed to Construction	Should we go ahead with the project?	<ul style="list-style-type: none"> - Are there any reasons why the project should not be approved for implementation?

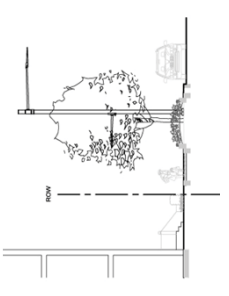
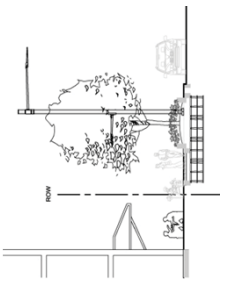
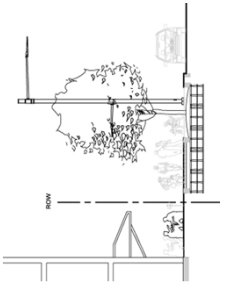
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APPENDIX H

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ZONE	LEVEL OF SERVICE	STANDARD URBAN	ENHANCED	PREMIUM
Continuity Strip Zone	Hardscape Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Paving Natural Stone Hardscape Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Paving Natural Stone Tactile Paving Trees and Planters Tree Deciduous 60mm Caliper Tree Deciduous 80mm Caliper Tree Deciduous 100mm Caliper Tree Coniferous 2.0m Height Tree Coniferous 2.5m Height Tree Coniferous 3.0m Height Single Tree Grate Flush Planter Curb Raised Planter Curb Seat-Wall Planter Curb (0.45m) Planting Soil Compacted Mulch Perennials and Ornamental Grasses Soil Cells Softscape Planting Bed Sod Perennials and Ornamental Grasses Deciduous Shrubs 600mm Height Deciduous Shrubs 1000mm Height Deciduous Shrubs 1500mm Height Coniferous Shrubs 600mm Height Hanging Flower Basket Free Standing Planter Furniture Bench Trash Receptacle Bicycle Rack Banners Way-Finding Signage Bollard	✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
Amenity Zone	Main Field Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Paving Natural Stone Paving Accent Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Paving Natural Stone Multi-Purpose Trails Asphalt Hardscape Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Pavers Natural Stone Softscape Planting Bed Sod Perennials and Ornamental Grasses Deciduous Shrubs 600mm Height Deciduous Shrubs 1000mm Height Deciduous Shrubs 1500mm Height Coniferous Shrubs 600mm Height	✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
Pedestrian Clearway Zone	Hardscape Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Pavers Natural Stone Softscape Planting Bed Sod Perennials and Ornamental Grasses Deciduous Shrubs 600mm Height Deciduous Shrubs 1000mm Height Deciduous Shrubs 1500mm Height Coniferous Shrubs 600mm Height	✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
Frontage Zone	Hardscape Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Pavers Natural Stone Softscape Planting Bed Sod Perennials and Ornamental Grasses Deciduous Shrubs 600mm Height Deciduous Shrubs 1000mm Height Deciduous Shrubs 1500mm Height Coniferous Shrubs 600mm Height	✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓
		✓	✓	✓

ZONE	LEVEL OF SERVICE		
	STANDARD URBAN	ENHANCED	PREMIUM
			
Median Zone	Hardscape		
	<ul style="list-style-type: none"> ✓ Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Paving Natural Stone Tactile Paving 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓
	Trees and Planters		
	<ul style="list-style-type: none"> ✓ Tree Deciduous 60mm Caliper Tree Deciduous 80mm Caliper Tree Deciduous 100mm Caliper Tree Coniferous 2.0m Height Tree Coniferous 2.5m Height Tree Coniferous 3.0m Height Seat-Wall Planter Curb (0.45m) Planting Soil Compacted Mulch Perennials and Ornamental Grasses 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
	Softscape		
	<ul style="list-style-type: none"> Planting Bed Sod Perennials and Ornamental Grasses Deciduous Shrubs 600mm Height Deciduous Shrubs 1000mm Height Deciduous Shrubs 1500mm Height Coniferous Shrubs 600mm Height 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓
	Standard		
	<ul style="list-style-type: none"> ✓ Street Lighting (Pole & Light) Pedestrian Lighting (Pole & Light) Pedestrian Lighting only (on existing Street Light Pole) Street & Pedestrian Lighting (Pole & Light) 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓
	Specialty		
	<ul style="list-style-type: none"> Bollard Lighting Paving Lighting Accent Lighting Seat-Wall Lighting Up Lighting Wall Wash Light 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓
	Low Impact Development Measures		
	<ul style="list-style-type: none"> Bioretention Rain Garden Vegetated Swale Box Planter Cistern 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓
	Major Intersection Corner Treatment		
	<ul style="list-style-type: none"> ✓ Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Paving Natural Stone Tactile Paving 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓
	Minor Intersection Corner Treatment		
	<ul style="list-style-type: none"> ✓ Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Pre-Cast Concrete Unit Pavers on Granular Base Permeable Paving Natural Stone Tactile Paving 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓
	Crosswalk		
	<ul style="list-style-type: none"> ✓ Asphalt with Painted Lines Poured in Place Concrete Pre-Cast Concrete Unit Pavers on Concrete Base Permeable Paving Natural Stone Raised Crosswalk Streetprint 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓

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APPENDIX I

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Streetscape Component Breakdown Chart

Intensification Area: Street Jurisdiction: Street Hierarchy:	Streetscape Type: Street: Blocks:	ROW Width: Boulevard Width:	LEVEL OF SERVICE				LIFE EXPECTANCY						
			DESIGN AND CAPITAL CONSTRUCTION		TOTAL / LINEAR METER		BASIC		ENHANCED		PREMIUM		
			ITEMS (BOULEVARD COMPONENT / ITEM)	QUANTITY	UNIT	CAPITAL UNIT COST	LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER
			TYPE	QUANTITY	UNIT	CAPITAL UNIT COST	LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER	UNIT COST / LINEAR METER
CONTINUITY STRIP ZONE			Approx. Streetscape Single Sided (m)										
Hardscaping			Single Sided										
Standard	Poured in Place Concrete	sq.m	\$100.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Enhanced	Pre-Cast Concrete Unit Pavers on Granular Base	sq.m	\$126.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Permeable Paving	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
			\$222.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
AMENITY ZONE													
Hardscaping													
Standard	Poured in Place Concrete	sq.m	\$100.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Enhanced	Pre-Cast Concrete Unit Pavers on Granular Base	sq.m	\$126.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Permeable Paving	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Tactile Paving	sq.m	\$222.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Trees and Planters													
Standard	Tree Deciduous 60mm Caliper	ea.	\$550.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Tree Deciduous 80mm Caliper	ea.	\$650.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Premium	Tree Deciduous 100mm Caliper	ea.	\$800.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Tree Coniferous 2.0m Height	ea.	\$625.00	#DIV/0!	\$0.00	35	35-55	55+	45				
Enhanced	Tree Coniferous 2.5m Height	ea.	\$750.00	#DIV/0!	\$0.00	35	35-55	55+	45				
Premium	Tree Coniferous 3.0m Height	ea.	\$1,200.00	#DIV/0!	\$0.00	90	100	100*	100*				
Standard	Single Tree Grate	lm	\$70.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Flush Planter Curb	lm	\$125.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Seat-Wall Planter Curb (0.45m)	lm	\$600.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Planting Soil	cubic.m	\$39.00	#DIV/0!	\$0.00	90	100	110*	100*				
Standard	Compacted Mulch	sq.m	\$25.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Perennials and Ornamental Grasses	sq.m	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Soil Cells	sq.m	\$573.00	#DIV/0!	\$0.00	90	100	110*	100*				
Softscape													
Standard	Planting Bed	sq.m	\$34.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Standard	Sod	sq.m	\$6.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Standard	Perennials and Ornamental Grasses	sq.m	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Deciduous Shrubs 600mm Height	ea.	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Deciduous Shrubs 1000mm Height	ea.	\$85.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Deciduous Shrubs 1500mm Height	ea.	\$120.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Coniferous Shrubs 600mm Height	ea.	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Hanging Flower Basket	ea.	\$75.00	#DIV/0!	\$0.00	10	10-20	20+	15*				
Enhanced	Free Standing Planter	ea.	\$250.00	#DIV/0!	\$0.00	10	10-20	20+	15*				
Furniture													
Enhanced	Bench	ea.	\$1,859.00	#DIV/0!	\$0.00	10	10-20	20+	15				
Enhanced	Trash Receptacle	ea.	\$2133.00	#DIV/0!	\$0.00	10	10-20	20+	15				
Enhanced	Bicycle Staind	ea.	\$233.00	#DIV/0!	\$0.00	10	10-20	20+	15				
Enhanced	Banners	ea.	\$375.00	#DIV/0!	\$0.00	10	10-20	20+	15*				
Standard	Way-Finding Signage	ea.	\$3,500.00	#DIV/0!	\$0.00	10	10-20	20+	15*				
Enhanced	Bollard	ea.	\$1,100.00	#DIV/0!	\$0.00	10	10-20	20+	15				
PEDESTRIAN CLEARWAY ZONE													
Main Field													
Standard	Poured in Place Concrete	sq.m	\$100.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Enhanced	Pre-Cast Concrete Unit Pavers on Granular Base	sq.m	\$126.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Permeable Paving	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Paving Accent													
Standard	Poured in Place Concrete	sq.m	\$100.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Enhanced	Pre-Cast Concrete Unit Pavers on Granular Base	sq.m	\$126.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Permeable Paving	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Tactile Paving	sq.m	\$222.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Multi-Purpose Trails													
Enhanced	Asphalt	sq.m	\$65.00	#DIV/0!	\$0.00	5	5-15	15+	10				
FRONTAGE ZONE													
Hardscaping													
Standard	Poured in Place Concrete	sq.m	\$100.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Enhanced	Pre-Cast Concrete Unit Pavers on Granular Base	sq.m	\$126.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Permeable Pavers	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Standard	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Softscape													
Standard	Planting Bed	sq.m	\$34.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Standard	Sod	sq.m	\$6.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Perennials and Ornamental Grasses	sq.m	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Deciduous Shrubs 600mm Height	ea.	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Deciduous Shrubs 1000mm Height	ea.	\$85.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Deciduous Shrubs 1500mm Height	ea.	\$120.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Coniferous Shrubs 600mm Height	ea.	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25				
MEDIAN ZONE													
ILLUMINATION ELEMENTS													
Low Impact Development Measures													
Enhanced	Bioretention	sq.m	\$1,400.00	#DIV/0!	\$0.00	35	35-55	55+	45*				
Enhanced	Rain Garden	sq.m	\$1,900.00	#DIV/0!	\$0.00	35	35-55	55+	45*				
Enhanced	Vegetated Swale	sq.m	\$23.00	#DIV/0!	\$0.00	35	35-55	55+	45*				
Enhanced	Box Planter	sq.m	\$1,900.00	#DIV/0!	\$0.00	35	35-55	55+	45*				
Enhanced	Cistern	sq.m	\$606.00	#DIV/0!	\$0.00	35	35-55	55+	45*				
INTERSECTION ZONE													
Major Intersection Corner Treatment													
Standard	Poured in Place Concrete	sq.m	\$100.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Standard	Pre-Cast Concrete Unit Pavers on Granular Base	sq.m	\$126.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Permeable Paving	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Standard	Tactile Paving	sq.m	\$222.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Minor Intersection Corner Treatment													
Standard	Poured in Place Concrete	sq.m	\$100.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Standard	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Standard	Pre-Cast Concrete Unit Pavers on Granular Base	sq.m	\$126.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Permeable Paving	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Standard	Tactile Paving	sq.m	\$222.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Crosswalk													
Standard	Asphalt with Painted Lines	sq.m	\$67.00	#DIV/0!	\$0.00	5	5-15	15+	10				
Enhanced	Poured in Place Concrete	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25				
Enhanced	Pre-Cast Concrete Unit Pavers on Concrete Base	sq.m	\$222.00	#DIV/0!	\$0.00	25	25-35	35+	30				
Enhanced	Permeable Paving	sq.m	\$117.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Natural Stone	sq.m	\$200.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Premium	Raised Crosswalk	ea.	\$7,000.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
Enhanced	Street Print	sq.m	\$50.00	#DIV/0!	\$0.00	20	20-30	30+	25*				
SPECIAL FEATURES													
Lump Sum Features													
ea.	Special Feature A	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature B	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature C	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature D	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature E	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature F	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature G	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature H	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature I	ea.	\$0.00	#DIV/0!	\$0.00								
ea.	Special Feature J	ea.	\$0.00	#DIV/0!	\$0.00								
UPGRADES													
Elements to be Upgraded													
	Upgrade Element 1		\$0.00	#DIV/0!	\$0.00								
	Upgrade Element 2		\$0.00	#DIV/0!	\$0.00								
	Upgrade Element 3		\$0.00	#DIV/0!	\$0.00								
	Upgrade Element 4		\$0.00	#DIV/0!	\$0.00								
	Upgrade Element 5		\$0.00	#DIV/0!	\$0.00								
	Upgrade Element 6		\$0.00	#DIV/0!	\$0.00	</							

APPENDIX J

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Operations and Maintenance Assumptions

Operations and Maintenance STREETSCAPE LENGTH APPROX. LINEAR METERS

Note: Operation and Maintenance Calculated Annually

ZONE	MAINTENANCE ELEMENT	MAINTENANCE INCLUDED	RESPONSIBLE DEPARTMENT	MAINTENANCE UNIT COST	UNIT TYPE	TOTAL UNIT COST	ROUNDED UNIT COST	UNIT TYPE
CONTINUITY STRIP ZONE	Hardscape Concrete	Concrete Repairs *Including 10% landscape restoration	Public Works	\$0.11	sq.m	\$0.11	\$0.25	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Granular Base	Public Works	\$7.00	sq.m	\$7.00	\$7.00	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Concrete Base	Public Works	\$15.00	sq.m	\$15.00	\$15.00	sq.m
	Spring Cleanup	Salt Strip Sweeping	Parks and Forestry	\$0.38	sq.m	\$0.38	\$0.40	sq.m
	Snow	Snow Removal	Public Works	\$20.00	sq.m	\$20.00	\$20.00	sq.m
	Hardscape Concrete	Concrete Repairs *Including 10% landscape restoration	Public Works	\$0.11	sq.m	\$0.11	\$0.25	sq.m
AMENITY ZONE	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Granular Base	Public Works	\$7.00	sq.m	\$7.00	\$7.00	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Concrete Base	Public Works	\$15.00	sq.m	\$15.00	\$15.00	sq.m
	Hardscape Planter Curb	Concrete Repairs *Including 10% landscape restoration	Public Works	\$0.11	lm	\$0.11	\$0.25	lm
	Snow	Snow Removal	Public Works	\$20.00	sq.m	\$20.00	\$20.00	sq.m
	Street Trees	Pruning (\$500 / yr on 6 yr cycle) Watering (10 yr life cycle)	Parks and Forestry	\$85.00	ea.	\$85.00	\$85.00	ea.
		Mulching and Fertilization (\$15 / 3 yr) Infiltration / Irrigation / Flushing	Parks and Forestry	\$5.00	ea.	\$5.00	\$5.00	ea.
		Basic Root Pruning (\$30/35 yr lifecycle)	Parks and Forestry	\$0.86	ea.	\$2.50	\$2.50	ea.
		Basic Urban Root Pruning (\$30/35 yr lifecycle)	Parks and Forestry	\$3.00	ea.	\$0.86	\$0.86	ea.
	Softscape	Planter Watering / Maintenance	Parks and Forestry	\$25.00	sq.m	\$25.00	\$25.00	sq.m
		Hanging Basket Maintenance	Parks and Forestry	\$25.00	ea.	\$25.00	\$25.00	ea.
		Trash Receptacle	Parks and Forestry	\$640.00	ea.	\$640.00	\$640.00	ea.
		Ground Cover Trash Removal / Maintenance	Parks and Forestry	\$10.00	sq.m	\$10.00	\$10.00	sq.m
	Lawn Mowing (incl debris cleanup)	Parks and Forestry	\$0.03	sq.m	\$0.03	\$0.03	sq.m	
PEDESTRIAN CLEARWAY ZONE	Hardscape Concrete	Concrete Repairs *Including 10% landscape restoration	Public Works	\$0.11	sq.m	\$0.11	\$0.25	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Granular Base	Public Works	\$7.00	sq.m	\$7.00	\$7.00	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Concrete Base	Public Works	\$15.00	sq.m	\$15.00	\$15.00	sq.m
	Snow	Snow Plowing	Parks and Forestry	\$0.82	sq.m	\$0.82	\$1.00	sq.m
FRONTAGE ZONE	Asphalt	Asphalt Repair	Public Works	\$6.50	sq.m	\$6.50	\$7.00	sq.m
	Hardscape Concrete	Concrete Repairs *Including 10% landscape restoration	Public Works	\$0.11	sq.m	\$0.11	\$0.25	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Granular Base	Public Works	\$7.00	sq.m	\$7.00	\$7.00	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Concrete Base	Public Works	\$15.00	sq.m	\$15.00	\$15.00	sq.m
	Softscape	Planting Bed Maintenance (debris cleanup, mulching et.) Ground Cover Trash Removal / Maintenance	Parks and Forestry	\$0.16	sq.m	\$0.16	\$0.25	sq.m
		Lawn Mowing	Parks and Forestry	\$10.00	sq.m	\$10.00	\$10.00	sq.m
	Median Hardscape	Litter Removal	Public Works	\$1.00	sq.m	\$1.00	\$1.00	sq.m
	Median Softscape	Planter Watering / Maintenance	Parks and Forestry	\$25.00	sq.m	\$25.00	\$25.00	sq.m
	Street Trees	Ground Cover Trash Removal / Maintenance Pruning (\$500 / yr on 6 yr cycle) Watering	Parks and Forestry	\$10.00	sq.m	\$10.00	\$10.00	sq.m
		Mulching and Fertilization (\$15 / 3 yr) Basic Root Pruning (\$30/35 yr lifecycle)	Parks and Forestry	\$85.00	ea.	\$85.00	\$85.00	ea.
		Basic Urban Root Pruning (\$30/35 yr lifecycle)	Parks and Forestry	\$0.86	ea.	\$80.00	\$80.00	ea.
		Basic Tree Removal/Stumping (\$550 at end of 35 yr life) Tree Removal/Stumping (\$250 at end of 10 yr life) Infiltration / Irrigation / Flushing	Parks and Forestry	\$3.00	ea.	\$5.00	\$5.00	ea.
	Street Lighting	Public Works	\$15.71	ea.	\$3.00	\$3.00	ea.	
ILLUMINATION ELEMENTS	Pedestrian Lighting	Street Lighting	Public Works	\$25.00	ea.	\$25.00	\$25.00	ea.
	Specialty Lighting	Street Lighting	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
		Street / Pedestrian Combo	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
		Bollard Lighting	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
		Paving Lighting	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
		Accent Lighting	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
		Seat-Wall Lighting	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
		Up Lighting	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
		Wall Wash Lighting	Public Works	\$36.00	ea.	\$36.00	\$36.00	ea.
	Bioretention	Concrete Repairs *Including 10% landscape restoration	Public Works	\$21.50	sq.m	\$21.50	\$22.00	sq.m
	Rain Garden	Pruning (\$500 / yr on 6 yr cycle)	Parks and Forestry	\$23.50	sq.m	\$23.50	\$24.00	sq.m
	Vegetated Swale	Watering	Parks and Forestry	\$0.60	sq.m	\$0.60	\$1.00	sq.m
Box Planter	Concrete Repairs *Including 10% landscape restoration	Public Works	\$21.50	sq.m	\$21.50	\$22.00	sq.m	
Cistern	Concrete Repairs *Including 10% landscape restoration	Public Works	\$125.00	ea.	\$125.00	\$125.00	ea.	
INTERSECTION ZONE (Pedestrian Corner Treatments)	Hardscape Concrete	Concrete Repairs *Including 10% landscape restoration	Public Works	\$0.11	sq.m	\$0.11	\$0.25	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Granular Base	Public Works	\$7.00	sq.m	\$7.00	\$7.00	sq.m
	Hardscape Unit Paving	Unit Paver Repairs *Including 10% landscape restoration Concrete Base	Public Works	\$15.00	sq.m	\$15.00	\$15.00	sq.m
	Snow	Snow Plowing	Parks and Forestry	\$0.82	sq.m	\$0.82	\$1.00	sq.m
		Snow Removal	Public Works	\$20.00	sq.m	\$20.00	\$20.00	sq.m